MINERAL CREEK SITE
AND
HOOPER RANCH PUEBLO
EASTERN ARIZONA

PAUL S. MARTIN

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FIELDIANA: ANTHROPOLOGY

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AERIAL VIEW OF HOOPER RANCH PUEBLO AND
SURROUNDING TERRAIN

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AND
HOOPER RANCH PUEBLO
EASTERN ARIZONA

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Preface

Field Season of 1959

This is the third report in a projected series of monographs on the archaeology of the drainage of the Upper Little Colorado River. In this territory lie the towns of Springerville, St. Johns, Show Low and Vernon, Arizona.

After investigating the Mogollon sequence of the Reserve, New Mexico, area for about fifteen seasons, and finding that that area had been abandoned probably during the thirteenth century, we were eager to find out where the Mogollon Indians moved to, why they emigrated, and what became finally of the cultural elements that they had developed. Did these elements disappear, leaving no traces? Or had they been passed on to other groups, and if so, would we be able to detect them? Had Mogollon influences filtered into the Zuni area or had Mogollon people themselves left their ancient homeland in the mountains of western New Mexico and migrated in to the Zuni region proper?

From preliminary surveys and from a thorough search of the literature on the prehistory of the Upper Little Colorado River we felt we might have some success in finding answers to a few of the questions posed above if we were to pursue archaeological reconnaissance and excavation of key sites in the Upper Little Colorado River drainage.

We moved the base of our operations in 1956 to Vernon, Arizona, and Dr. John Rinaldo initiated there an archaeological survey late that summer. Two monographs concerning our work have already appeared (Martin and Rinaldo, 1960a, b).

It would appear now that Mogollon or Mogollon-like traits had penetrated this area perhaps as early as A.D. 900 or earlier. But it also is possible that another group (descendants of the people who were responsible for the Concho Complex?) was already in the area. Our present impression of the course of events in the Vernon area is that by A.D. 1000 or A.D. 1100, certainly, Mogollon traits were becoming more popular. At least they were more abundant than in the centuries just previous to A.D. 1000 and we can recognize correlations between the later Mogollon

sites of the Pine Lawn–Reserve area of New Mexico and the twelfth to fourteenth century sites of the Upper Little Colorado.

Two sites and the results of our archaeological reconnaissance are described in this publication. The Mineral Creek Site—a dozen surface contiguous rooms and a circular Great Kiva (perhaps a village in the formative stage)—is perhaps a century or two earlier than the Hooper Ranch Pueblo, which consisted of about 60 rooms and 3 kivas (fig. 1). There is a chronological hiatus between them. Definite relationships between these sites and some in the Pine Lawn–Reserve area (New Mexico) were observed.

The Mineral Creek Site (SE ¼, NW ¼, Sec. 13, Twp. 10 N., R. 25 E., G.S.R.M.) is located on land owned by Mr. Earl Thode of Vernon, Arizona. This is the second site we have dug on Mr. Thode's ranch, and we are grateful for this courtesy and for permission to bring the artifacts to Chicago for study and display.

The Hooper Ranch Pueblo is located at the edge of the present channel of the Little Colorado River (Sec. 8, Twp. 9 N., R. 29 E., G.S.R.M.). It is owned by Mr. Robert B. Hooper. Mr. and Mrs. Hooper generously gave us permission to dig the site and to bring materials recovered to the Museum for study and display.

We are grateful to these friends who gave us access to the ruins and who helped us most of all by watching our progress and evincing enthusiasm for our work.

Mr. William Longacre, graduate student at the University of Chicago, conducted the survey and found over 100 sites. His report is included in this volume.

The field party consisted of myself, as leader of the expedition; Dr. Rinaldo, in charge of the digging operations; Mrs. Martha Perry, cook; and the following students and diggers: Margaret Alder and Mark Winter, who classified and tabulated the sherds and maintained the field catalogue of specimens; Roland Strassburger, photographer and general assistant; Paul Curtis, Jr., Michael Fox, Joe Goodman, Martin Hoffman, and Alfred Padilla. Mrs. John Rinaldo helped wash sherds whenever necessary. In the early stages of the work Mr. Howard Anderson, a member of the staff of the Department of Anthropology, assisted in maintenance work, in digging, and in cataloging. After he returned to the Museum Mr. Anderson ground 100 thin sections of pottery for petrographic analysis. Mr. Allen Liss, also of this department, aided us in the latter half of the season by taking up where Mr. Anderson had left off and by lending a hand in final packing and closing camp. To all of these assistants and friends, I am happy to make personal acknowledg-

FIG. 1. Map showing location of Mineral Creek Site and Hooper Ranch Pueblo, Arizona.

ment of my appreciation for their cooperation, industry, and skills in all phases of the work. Without their good will the expedition would have foundered.

Much time and great efforts were expended by Dr. Albert W. Forslev, Associate Curator of Mineralogy, and Mr. Bertram G. Woodland, Associate Curator of Petrology, in examining the potter's clay and the unfired bowl, both described in Chapter IV. Mr. Forslev took samples of both specimens and made analyses of the clay minerals and size distribution of the materials in the two samples. Mr. Woodland made petrographic examinations of the 100 thin sections of pottery and supervised in both oxidizing and reducing atmospheres on the clay samples mentioned above and on sherds from the Mineral Creek Site and Hooper Ranch Pueblo. But they went far beyond the necessary but routine analyses. Throughout the long time period required for these jobs they evinced great enthusiasm for our project and interest in our problems. We are grateful to them and to Mr. Anderson, who not only produced the 100 thin sections but also assisted Dr. Forslev and Mr. Woodland in other ways.

Dr. Fritz Haas examined and identified the shells and for this we are grateful.

Mr. Leigh Richey, of St. Johns, Arizona, gave unstintingly of his time and priceless knowledge of the archaeological aspects of the area. His generous attitude was a source of inspiration for all of us, and his assistance was invaluable to our archaeological reconnaissance and to Mr. Longacre, who was conducting it.

Gratitude is also expressed to others who helped Mr. Longacre in locating sites. Their knowledge and assistance brought much to our attention that might easily have escaped notice: Mr. and Mrs. Wayne Brinkenhoff, Mrs. Vincent Butler, Mr. William Castro, Mrs. Jewel Cowley, Mrs. E. Highwood, Mrs. Leola Mineer, Mr. Gilbert Sogge, and Mr. and Mrs. Harvey Wilhelm.

Many other friends and neighbors in and near Vernon deserve more than this brief mention for their sterling friendship, for their interest in our daily progress, and for their eagerness to give unsparingly of time and effort without question of convenience to themselves. Living in an urban community as I do, I value highly these almost forgotten pleasing traits. These friends and neighbors are: Mr. and Mrs. Tom Cox, Mr. and Mrs. Lester Curtis, Mr. George Dutson, Mr. and Mrs. Don Goodman, Messrs. Charles, Leon and Milton Gillespie and their families, Mr. Cecil Naegle, the Nikolous brothers, Mr. and Mrs. Leonard Penrod, Mr. and Mrs. Floyd Penrod, Dr. Max E. Taylor, Mr. Glen Stratton and Mr. and Mrs. Eben Whiting.

Dr. Charles W. Keney of Gallup, New Mexico, was our medical adviser and served us in person and by long distance telephone with distinction and without charge. Mr. Clair E. Gurley, President of Central Motor Company of Gallup, gave us much aid and provided us with motor vehicles at a minimum charge. To both of these friends I am deeply obligated.

Miss Lillian Ross, Associate Editor of Scientific Publications, has again smoothed out my maladroit mode of speech and has supplied felicitous, clear phrases for turgid ones. We thank her for her consummate skill in editing.

Miss Lillian Novak typed the sherd tabulations that are published on microcard.

Mrs. Virginia Turner, my secretary, has patiently typed and retyped the manuscript so often that she can quote almost whole paragraphs. I am indeed grateful to her for this and for her skill and dispatch.

Once again, and for the twenty-fifth time, it is my pleasure to express our very special appreciation and gratitude to President Stanley Field and to Dr. Clifford C. Gregg, Director, for backing our archaeological researches with an interest that is probably unmatched.

Chapters I, II, and III were written by Dr. Rinaldo, Chapter V by Mr. Longacre, and Chapters IV and VI by me.

PAUL S. MARTIN

June, 1960

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I. Architectural Details, Mineral Creek Site

This pueblo is situated on a high bank above the bottom land of the creek for which it is named, and about two and a half miles east of Vernon, Arizona. It is located on the ranch of Mr. Earl Thode, in a pasture just south of the Springerville-Show Low highway.

The pueblo (figs. 2 and 3) appears to have been built in the form of a rectangle, possibly three or four rooms in width. South of this block of rooms is the Great Kiva (see pp. 23–26). This Great Kiva and six rooms of the pueblo were excavated.

WALLS

Foundation.—No prepared footing; masonry starts on sterile gravelly clay 10–20 cm. above floor level.

Types of Masonry.—Type I (fig. 4): A composite product of selected large boulders of igneous rock (scoria), of rough-hewn sandstone blocks, and of oval cobbles; the boulders and larger blocks of sandstone were laid with flat side toward room in fairly even courses with thick mud mortar; courses of larger stones (15 to 30 cm. long) alternate with courses of smaller stones (10 to 15 cm. long) and some stream cobbles. Both sizes of stones are generally oblong in proportion. Courses were leveled and chinks between the courses were filled in with some small pebbles.

Type II (fig. 5): Generally used in opposite face of wall with Type I masonry; made up of cobbles, smaller pebbles and some igneous rocks laid flat side toward room, with thick mud mortar; little attempt at coursing; appearance crude.

Dimensions.—Walls range from 28 to 40 cm. in width (average 32 cm.); height of standing walls 35 to 80 cm. Thickness same at base as at top of wall.

Materials.—Wall-stones are predominantly of igneous rocks such as basalt and scoria; some sandstone was used.

Joints.—Not intentionally broken; there was no consistent pattern of broken joints.

Spalls.—No true bearing spalls; some thin flat and round pebbles fill chinks.

FIG. 2. Mineral Creek Site, looking south; unexcavated portion on right.

Mortar.—Of dark brown mud; usually soft.

Plaster.—Single thin layer of gray adobe mud; undecorated.

Doorways.—No lateral doorways; entrance possibly through hatchways in roofs.

Ventilator (fig. 6).—In east wall of Room 5 an adobe threshold 17 cm. above floor; opening 30 cm. wide, 26 cm. high, narrows down on side adjoining Room 1 to 21 cm. wide; sides of slabs set on edge.

FLOORS AND FLOOR FEATURES

Floors.—Of gravelly clay; uneven.

Bins (fig. 7).—A series of three was built against the west wall of Room 5 opposite firepit and ventilator; the bottoms were stone slabs and the walls were built of slabs set on edge; each bin was 29–38 cm. wide, and 16–27 cm. deep.

Firepits (fig. 6).—In three rooms; one rectangular and two generally oval. One in Room 3 was rectangular, near center of floor, no rim; lined with adobe and gravel; ash-filled; 40 by 40 cm., 8 cm. deep. One in Room 4 has stone-rimmed sides, gravel bottom; ash-filled; 45 by 44 cm.,

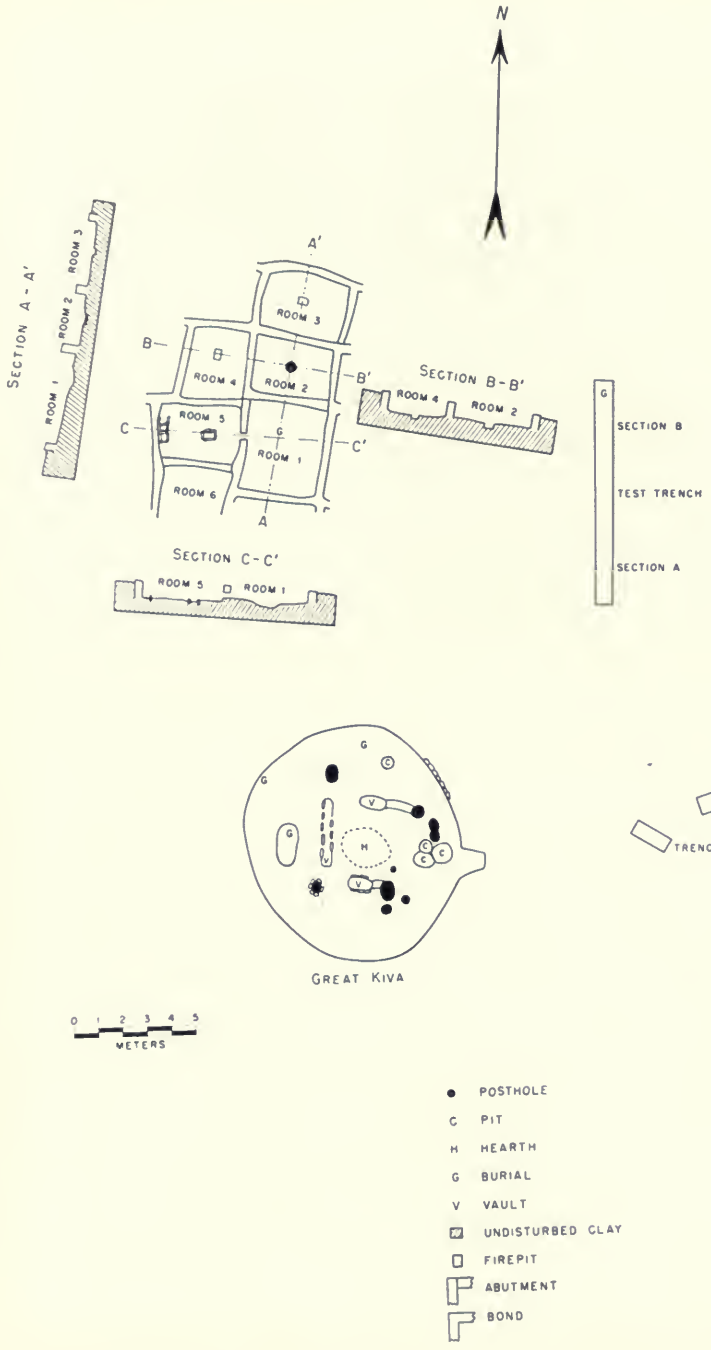

FIG. 3. Ground plan and sections of excavated portion of Mineral Creek Site.

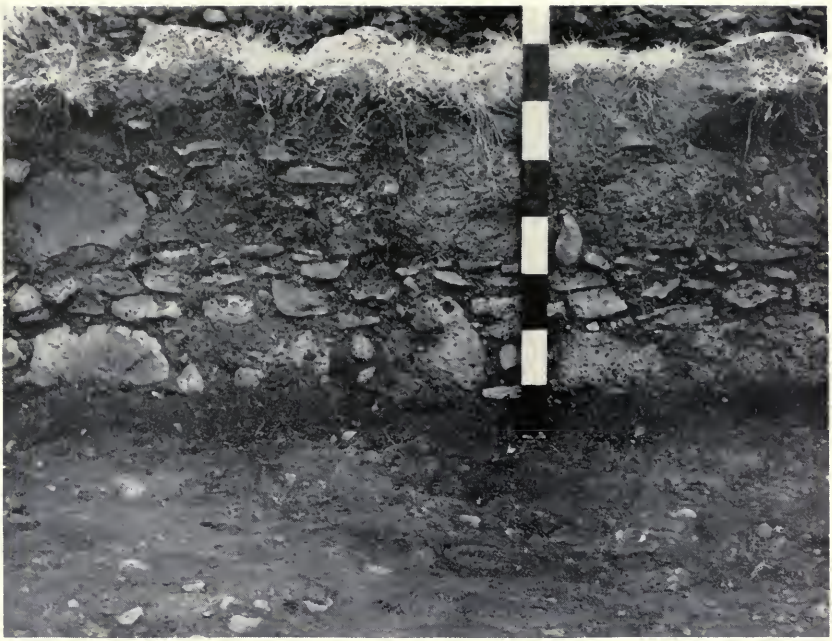

FIG. 4. North wall of Room 1, Mineral Creek Site. Meter stick at right center.

FIG. 5. South wall of Room 2, Mineral Creek Site. Meter stick at center.

FIG. 6. Firepit in Room 5 and ventilator through partition wall between Rooms 1 and 5, showing construction. Arrow points magnetic north.

FIG. 7. Firepit and bins in Room 5, Mineral Creek Site. Meter stick in background; arrow points magnetic north.

18 cm. deep. One in Room 5 is set in floor so that the top of the sides, made of slabs set on edge, protrudes above floor level; ash-filled; 53 by 30 cm., 20 cm. deep.

CEILINGS

Height.—Not known. On basis of number of fallen wall rocks and highest standing walls estimated at about 2 meters.

Construction.—Known only by inference; presence of a single large post-hole (50 cm. diameter; containing charcoal), a section of burned beam and small pieces of burned adobe in Room 2 indicates that a single main beam ran across the narrow dimension (north and south) with poles resting on that (and possibly on top of the end walls), and with splints or brush and clay as the top layers.

ARTIFACTS

No whole or restorable pottery vessels were found on the floors of the rooms (the burial in Room 1 was in a shallow pit). Metates were found in Rooms 1, 2, 3 and 5. Those in Rooms 2 and 3 were broken; one in Room 5 was near the northwest corner; one in Room 1 was in the southwest quadrant. Manos found in the same rooms on the floor were not in direct association.

GREAT KIVA

(Figures 8–10)

Shape.—Generally round with a slight tendency for the east walls on either side of the entrance to be straight rather than curved.

Dimensions.—Greatest inside diameter 9.3 (north to south) by 9.0 meters (east to west).

Walls.—Of native gravelly earth covered with coating of mixed adobe and sand. Small patch of rubble masonry veneer in northwest quadrant consisted of stream cobbles and some flat stones; masonry very crude.

Floor.—Gravelly earth with coating of mixed adobe and sand; undulating surface, not even.

Lateral Entrance.—Steep, short lateral ramp located near center of east side. Width at inner end 1.5 meters, at outer end 73 cm.; length, 1.0 meter.

Hearth Area.—Generally oval burned region with ashes and charcoal on surface, 1.5 by 2.0 meters; located near center between vaults.

Pits.—Four were found. Three, at entrance, were round, shallow, and basin-like, with intersecting rims; diameter at mouth 40 to 80 cm., at bottom 30 to 70 cm.; depth, 15 to 20 cm. One, north of northern vault, was 60 cm. in diameter and 15 cm. deep. Walls and floor were

FIG. 8. Great Kiva, Mineral Creek Site, from the west; entryway in background, vaults, postholes and grooves in foreground.

compact, light-colored gravelly soil. Pits contained dark brown soil and flecks of charcoal.

Postholes.—Four primary, three secondary, two doubtful. The primary postholes, vaults and grooves form a large rectangle in the center of the kiva; least diameter, 35 cm.; greatest diameter, 60 cm.; least depth, 55 cm.; greatest depth, 60 cm. There was one primary posthole in each quadrant, two of these in line with vaults or grooves.

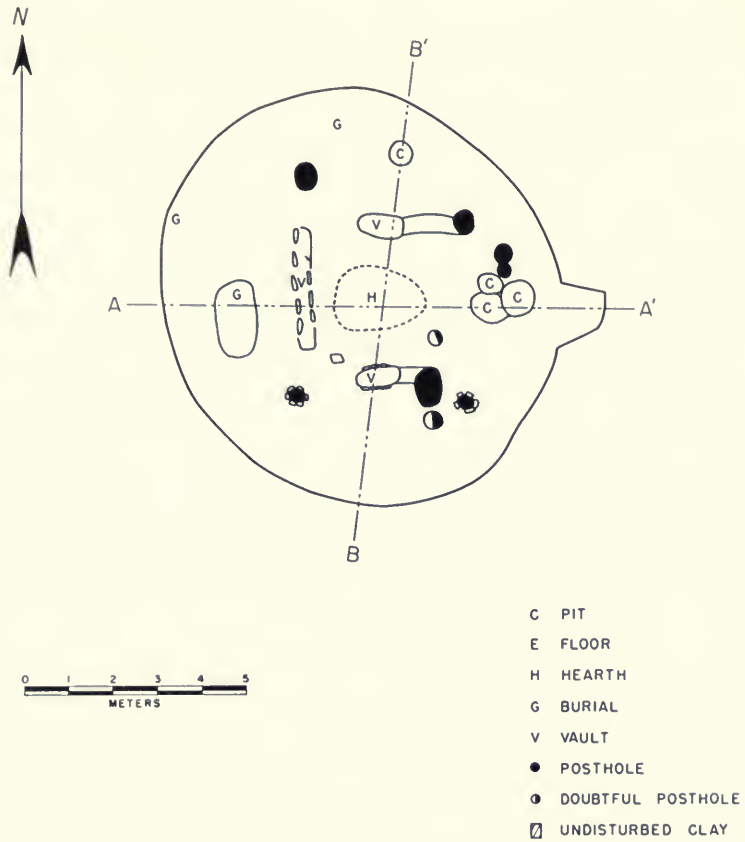

FIG. 9. Ground plan and sections of Great Kiva, Mineral Creek Site.

Grooves.—Three in number (including vaults): one between primary postholes in southwest and northwest quadrant; one connecting north vault and primary posthole in northeast quadrant; and one connecting south vault and primary posthole in southeast quadrant. West groove stone-slab-lined.

Vaults.—Two in number, one on either side of hearth area. The sides and ends of the south vault were lined with stone slabs set on edge. Scattered slabs were found in the north vault. There was a slightly slanting shelf on the north and south sides of both vaults (fig. 10).

Roof.—Beams rested on primary posts. On these rested poles running north and south (charred poles found). The poles were covered with splints or brush, covered with adobe (evidence from impressions in burned roof clay).

Pottery.—See Chapter IV.

Artifacts.—Mortar, pestle, paint palette, choppers, scrapers, and knives were found on floor. A large piece of red petrified wood (length, 18 cm., width, 12 cm.) was found near the west end of the south vault; another of the same size was found beneath the hearth area.

GENERAL COMMENTS

Although Room 4 burned, the fire did not spread to other rooms in the pueblo. Test pits dug through the floor levels revealed only sterile gravelly clay. The crude character of the masonry in general, the unequal size of the rooms, and their lack of symmetry may represent a stage in architectural development roughly parallel to that of South Leggett Pueblo in the Reserve area, although the ceramics indicate a more advanced stage.

The alignment of ventilator, firepit and bins in Room 5 seems to suggest something parallel to the rooms at Higgins Flat Pueblo, Apache Creek Pueblo, and Foote Canyon Pueblo in the Reserve area, where there was a similar arrangement of ventilator, firepit and mealing receptacles.

The Great Kiva, the largest structure in the village, was several times the size of any one of the rooms. It seems possible that the circular shape of the structure is an Anasazi feature, since all Anasazi Great Kivas thus far excavated have been circular (Roberts, F. H. H., 1929, pp. 73–90; 1932, pp. 86–98; 1939, pp. 127–136; Martin, P. S., 1936, pp. 46–51; 1939, pp. 350, 356; Morris, E. H., 1921, pp. 115–138; 1939, pp. 82–83; Hewett, E. L., 1936, pp. 93–97; Judd, N. M., 1954, p. 33, fig. 3). On the other hand—and these may equally well be precursors of the Mineral Creek Great Kiva—most of the Mogollon Great Kivas occupied before

FIG. 10. Detail of south vault in Great Kiva, Mineral Creek Site, showing stone lining. Scale in 10 cm. units at left.

FIG. 11. Burial 1, Great Kiva, Mineral Creek Site.

A.D. 700 such as Pithouse A at the SU Site (Martin and Rinaldo, 1940, p. 14), House 5 at the Bluff Site (Haury and Sayles, 1947, p. 21), Pithouse 9 at the Crooked Ridge Site (Wheat, 1954, p. 58), and the Bear Ruin Kiva (Haury, 1940, p. 43) are also generally circular or rounded in floor plan.

It is possible that the short lateral entryway on the east side may also be a carry-over from the earlier Mogollon Great Kivas. Similar entryways were noted in Pithouse A at the SU Site, and in Pithouse B at Promontory Site (Martin, Rinaldo and Antevs, 1949, p. 86). Of course, it is also possible that this recess contained ventilator apparatus of some perishable material and was not used as an entryway at all.

The arrangement of the large primary postholes and of the vaults and grooves outlining a rectangular area around the hearth is suggestive of similar layouts of grooves and/or vault-like pits at the Sawmill Site Great Kiva (Bluhm, 1957, fig. 3), Pithouse K at Turkey Foot Ridge (Martin

and Rinaldo, 1950a, p. 284, fig. 101), and Pithouses 9 and 19 at Crooked Ridge Village (Wheat, 1954, pp. 58–62).

The north and south vaults—flanking as they do the entryway hearth area alignment of the structure—recall vaguely the much more elaborate flanking vaults in Anasazi Great Kivas, as well as some single "foot-drum" vaults in smaller kivas such as Kiva A at the Village of the Great Kivas (Roberts, Frank H. H., 1932, p. 58). On the other hand, the grooves connecting the vaults and the primary postholes near the entrance are like the grooves in the Mogollon Great Kivas and bear only a vague analogy (in position) to the terraces which connect the two vaults and the closest southern posts in the Anasazi Great Kivas.

BURIALS IN MINERAL CREEK SITE
(Figure 11)

Five burials were encountered at Mineral Creek Site, three inside the Great Kiva, one in a secular room, and one in the trash to the east of these structures. All of the burials were flexed. Three had objects associated with them and were buried in pits that had been excavated through the floor. Two of the burials had pottery and other objects associated with them, the third only a large fragment of worked slab. Three were oriented with their heads to the south, one with the head toward the east and another with the head toward the west. One, a very young infant, was buried in the fill of the Great Kiva, with no associated objects. Another, a few years older, was buried in a shallow pit that had been excavated through the fill and floor of Room 1; it was accompanied by a duck effigy vessel and a necklace. A third, of adolescent age, was interred in a relatively deep pit near the west wall of the Great Kiva. A worked slab had been placed (or had fallen) in the pit. A number of large heavy stones were found above this burial, and some thin disk-shaped stone spalls in the fill nearby. One of these spalls had red paint on the surface and could have been used as a palette. A fourth burial, an adult, was accompanied by a black-on-red bowl and a red seed bowl which contained a projectile point and some chips; choppers, scrapers and polishing stones were found in the fill nearby. The fifth burial, an older individual, had been placed in shallow trash without any associated artifacts.

All the burials post-dated the occupation of the structure in which they were interred.

II. Architectural Details, Hooper Ranch Pueblo

LOCATION OF SITE

The Hooper Ranch Pueblo (figs. 12 and 13) is located on the east bank of the Little Colorado River about four miles downstream (north) of Springerville, where the gorge opens into the first valley north of Round Valley (Sec. 8, Twp. 9 N., R. 29 E., G.S.R.M.). Before excavation it formed a mound standing some 8 feet high, 100 feet wide and 135 feet long. The wall outlines of some of the rooms could be easily followed, and the pueblo as a whole appeared to be of rectangular shape, with a large rectangular Great Kiva at the south end. It contained perhaps fifty or sixty rooms in the upper habitation level. The site attracted us because the height of the mound and the pottery on the surface seemed to offer an opportunity to obtain stratigraphy and a local sequence in a relatively late site.

DEPOSITS

The upper levels of the rooms in the southwest quadrant of the mound (Rooms 1A, 2A, 3A, 5A, and 7A) were filled with refuse. The fill was ashy and contained large quantities of unworked animal bone, broken pottery, fragmentary artifacts, and other trash. This level did not extend down to the uppermost floor. Usually brown adobe clay, occasional roof timbers and other remnants of the ceiling were encountered above the floors of the upper habitation level. East or north of this area less refuse material was encountered in the fill.

The rooms of the lower habitation level were intentionally filled. This fill consisted chiefly of brown sandy clay and some rock. It was not ashy, and in general there were fewer artifacts or potsherds than in the fill of the upper habitation level. In a number of instances walls had been built on this clay fill.

ROOM DIMENSIONS

The smallest secular room in the upper habitation level, Room 17A, possibly a storeroom, was 2.5 meters long and 2.1 meters wide. The largest room, Room 5A, a dwelling room, was 3.85 meters long and 3.3 meters wide.

FIG. 12. Hooper Ranch Pueblo, looking north; unexcavated Great Kiva in foreground.

The rooms in the lower habitation level ranged both smaller and larger. The smallest room, Room 1B, measured 2.05 meters long by 1.6 meters wide; the largest, Room 5B, measured 4.5 meters long by 3.3 meters wide. Rooms in the upper habitation level averaged a very little longer. All rooms were roughly rectangular in floor plan.

WALLS

Foundations.—No trenches, large rock or other prepared foundations were discovered; the walls were based on about 10 to 20 cm. of adobe clay above sandstone bedrock, or less often on sandy clay and rock fill.

General Construction.—Most of the walls were constructed of composite stone masonry and consisted of two faces more or less interlocked near the center of the wall. There was no true core; some adobe mortar and occasionally a small pebble were found between stones or faces at the center of the wall. Rarely, a large, flat, rectangular slab had been laid as a

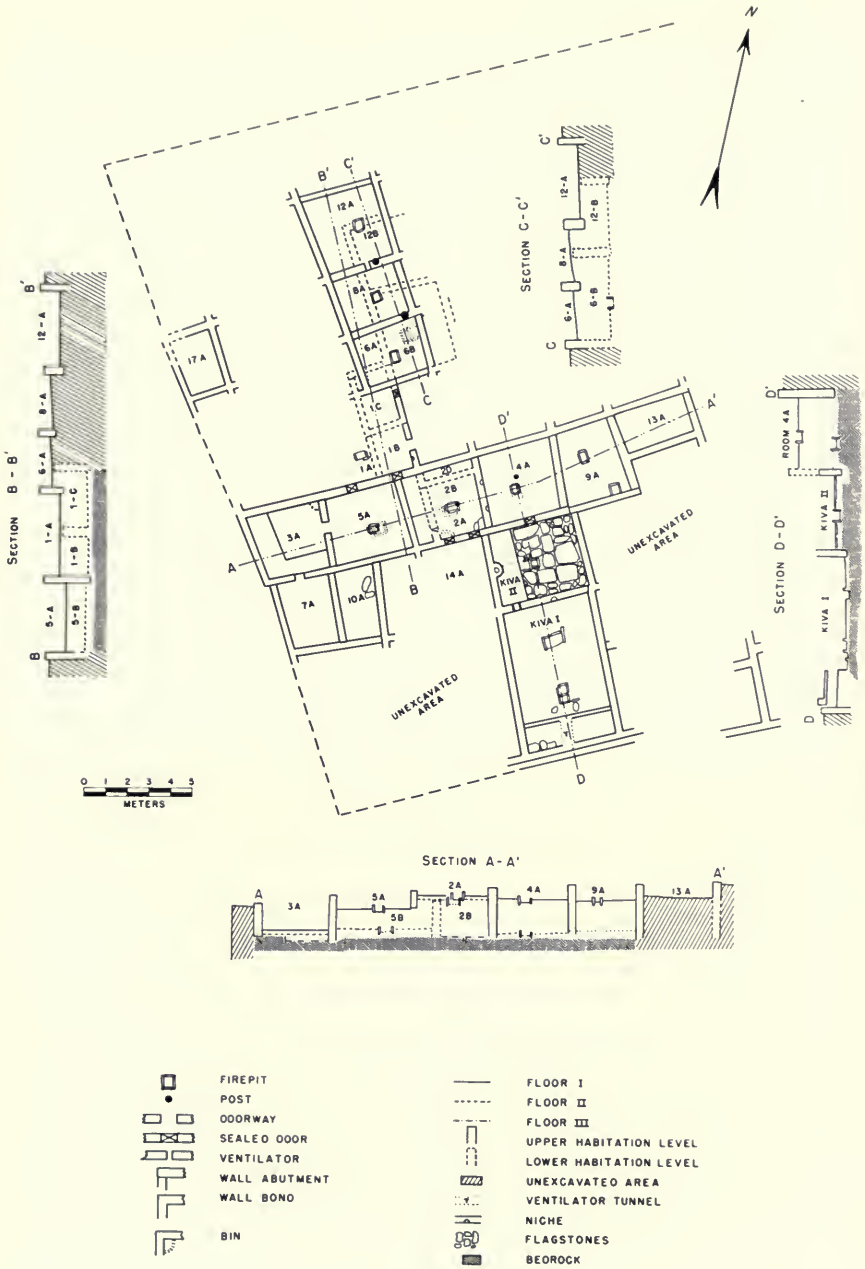

FIG. 13. Ground plan and sections of Hooper Ranch Pueblo.

through stone from one wall surface to the opposite one. Component horizontal slabs were laid up in a layer of mud mortar half a centimeter thick. There was no consistent pattern in the placement of the vertical joints. Some joints were broken near the middle of the stone in the next course above, others near the end of this stone. Joints range from stone-to-stone contact up to 4 cm. wide.

Wall Stones.—Local tan or red sandstone had been quarried in (1) long, thick slabs, or (2) short, thin slabs, or (3) chunks with some flat faces. Most of the stones were rough hewn, some with flat, dimpled surfaces; there were many laminated slabs. Large slabs were used in vertical slab (Type I) masonry (see below); average 57 cm. long and 39 cm. wide; up to 123 cm. long and 69 cm. wide.

Mortar.—A mixture of light brown or gray adobe clay and some sand; ranges from soft and crumbly to quite hard (can be scratched with pen knife); most of it is hard.

Spalls.—Small stone flakes and small, thin, flat, stone slabs were used ordinarily; rounded pebbles and potsherds were rare; spalls were inserted or laid in mortar to level up the courses, to fill in the voids, or, more frequently, to keep the wet mortar from squeezing out when the upper courses of stones were laid up. All spalls have one edge flush with the joints.

Plaster.—Walls of all except three rooms were plastered with one or two layers. Coats from 2 mm. to 30 mm. thick. The first coat—thicker and of coarser texture than the second coat—filled in the uneven surface of the masonry. The second coat was thin and of fine texture. The surface was undecorated and was dark gray or brown in color.

Masonry Type I (fig. 14).—A characteristic feature is large slabs set on edge as part of one face, usually as a course at the base of the wall, occasionally in courses above. Slabs were occasionally set 5 to 10 cm. apart and spaces between them were filled with small, thin slabs laid in a thick adobe cushion. Where the large slabs were rectangular, one or more small, thin slabs had been set vertically in chinks between them.

Slabs were set on edge at the base of 18 walls; they were set in courses above the base in two walls where they alternated with several courses of thin slabs laid horizontally between them. This type of masonry was used in one or both faces of a wall, and the opposite face was ordinarily composed of Type II (rubble) masonry or Type III (banded) masonry.

Masonry Type II (fig. 15).—This type is rubble masonry ordinarily of composite construction (two faces) built up of slabs and chunks of sand-

stone of various sizes laid in mud mortar. Bedding planes (horizontal joints) slope and are not continuous; courses change in thickness and are irregular and inconsistent. Stones in particular courses are not matched in size or color. Several thin slabs may be used to continue a bedding

FIG. 14. Masonry slabs set on edge (Type I) in north wall of Room 1-B, Hooper Ranch Pueblo. Meter stick at left.

plane set by a series of thicker slabs. Straight, flat surfaces of chunks and slabs are set flush with the visible surface of the wall. Walls were not plumb and there were many minor chinks and undulations in masonry surfaces; these rough places usually had been smoothed over with plaster.

Masonry Type III (fig. 16).—This type is banded masonry, also of composite construction; it slightly resembles Chaco masonry in exterior ap-

pearance (cf. Judd, 1954, pl. 5, fig. 2) but lacks the rubble core of Chaco masonry. It was built up of large, long slabs of approximately equal thickness (10 to 15 cm.) laid in even courses and alternating with bands of small, thin slabs and chips of laminate sandstone, both laid up in mud mortar. The courses are fairly level and neat-appearing; the stones are

FIG. 15. Rubble masonry (Type II) in north wall of Room 13A, Hooper Ranch Pueblo. Meter stick at right.

laid in bands matched in thickness but not in length; the bands are not uniform in color, nor are they contrasted in color (as in some Chaco masonry).

Dimensions.—Main walls are 25 cm. to 38 cm. thick; partition walls 20 cm. to 35 cm. thick; average thickness of walls 30 cm.; height of standing walls 85 cm. to 268 cm.; longest continuous wall (unbroken by abutments) 17 meters.

Doorways (fig. 17).—Rectangular in shape; usually located near the center of the side or end walls of the rooms. All are in the lower habita-

FIG. 16. Banded masonry (Type III) in north wall of Room 4A, Hooper Ranch Pueblo. Scale in 10 cm. units.

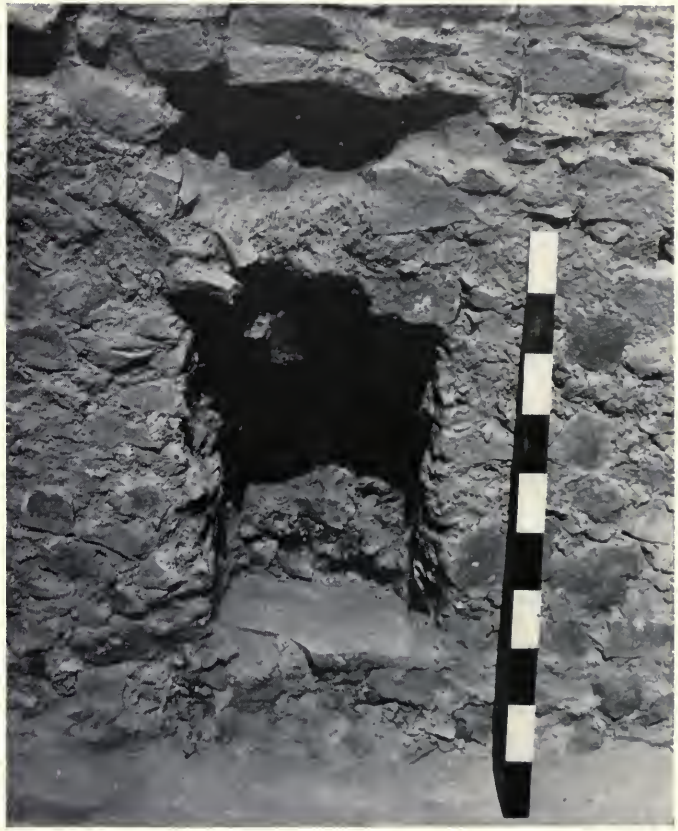

FIG. 17. Rectangular doorway in east wall of Room 3A, Hooper Ranch Pueblo, showing construction of sill and sides. Meter stick at right.

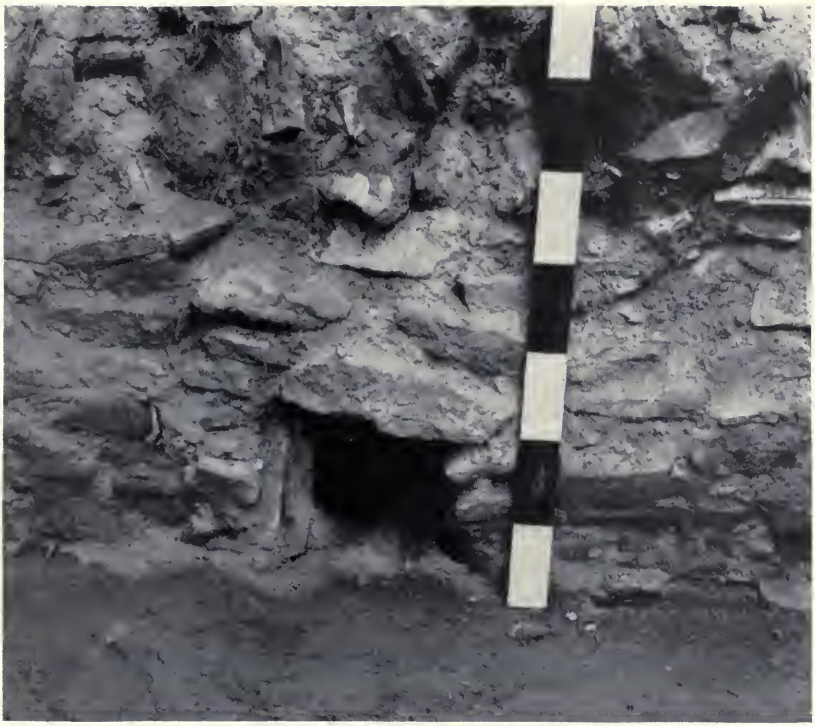

FIG. 18. Ventilator through partition wall between Rooms 8A and 12A, Hooper Ranch Pueblo, showing construction of lintel and sides. Meter stick at right.

tion level. Eight out of ten doors had been sealed, preventing entrance to other rooms. There were no exterior doorways. Sills were of thin stone slabs or masonry plastered over with adobe; lintels were more often of masonry, but in four instances were of stone slabs; sides were of masonry plastered over, except for one door, which had sides of stone slabs. Heights ranged from 38 cm. to 76 cm.; average, 57 cm. Widths ranged from 37 cm. to 55 cm.; average, 43 cm. Door sills ranged from 10 cm. to 66 cm. above floor level; average, 38 cm. Two with steps leading to them were 10 cm. and 20 cm. high.

Ventilator (fig. 18).—One, which was found between Rooms 8A and 12A, opened at the floor level of Room 8A, but 45 cm. above the floor of Room 12A; it was in the center of the north wall of Room 8A, not in line with the firepit of that room or of Room 12A. The opening was 20 cm. square; a stone slab set on edge formed the west side, and it had a stone slab lintel.

FIG. 19. Doorway and niche to right in east wall of Room 1B, Hooper Ranch Pueblo. Meter stick for scale.

Niches (fig. 19).—One in the east wall of Room 1B was rectangular in shape, adobe plaster lined, and located one meter above the floor south of the doorway. Height of opening 25 cm.; width of opening 15 cm. One in Room 2B, west wall, had a semicircular opening with a flat roof; it was plaster lined, and was 126 cm. above the floor near the southwest corner. Height of opening 12 cm.; width of opening 16 cm. There were two in Room 4A, Floor II, in the west wall, one with a semicircular opening, the other roughly circular, both plaster lined, 98 cm. and 90 cm. above floor. Height of openings 10 cm. and 12 cm.; width of both openings 12 cm.

FIG. 20. Room 9A, Hooper Ranch Pueblo, showing features of Floor I, firepit in foreground and bin in background. Meter stick in background; 50 cm. arrow points magnetic north.

FLOORS

(Figures 20–22)

Materials.—A layer of hard-packed adobe with smooth surface finish, ordinarily dark gray on surface, tan or brown underneath. Range in thickness, 1 cm. to 15 cm.; average thickness, 6.5 cm.

Alterations.—New surfaces had been added in some rooms (Rooms 2A, 3A, 9A); in other rooms floors were based on a fill of jumbled rock, adobe and sandy soil; fill separating floors ranges in thickness from 20 to 145 cm.

Bins (fig. 23).—Against the south wall of Room 9A; side and ends were made of stone slabs set on edge, and the bottom was made of a horizontal slab; 52 cm. long, 48 cm. wide, 30 cm. deep. The shape was rectangular. A bin(?) with a low adobe rim was found in the southwest corner of Room 2B; 60 cm. long, 25 cm. wide.

FIG. 21. Floor II, Room 4A, Hooper Ranch Pueblo, showing distribution of artifacts left on floor around firepit and posthole. Meter stick in background; 50 cm. arrow points magnetic north.

Firepits (fig. 24).—Eleven firepits were discovered in secular rooms. All were rectangular and lined with slabs set on edge; seven had slab-lined bottoms, three had clay and one a bedrock bottom; in six the longest dimension ran north and south, in five it ran east and west; each was located near the center of the room; they ranged in length from 50 cm. to 68 cm., in width from 37 cm. to 60 cm., and in depth from 10 cm. to 32 cm. All firepits contained fine white ash and a very little charcoal. There was always a gap between the slabs at one or more corners. Upright pot rest stones were found in six firepits.

Ash Pit (fig. 25).—Part of the firepit in Room 6B and in the kivas partitioned from firepit by stone slab set on edge; rectangular in shape, ends and sides of slabs set on edge, bottom of bedrock. Filled with fine white ash.

FIG. 22. Room 2B, Hooper Ranch Pueblo, possibly a storeroom, showing central post for roof support. Meter stick in background; 50 cm. arrow points magnetic north.

CEILINGS OR ROOFS

Height.—Actual height is not known. Highest standing wall 2.68 meters (Room 9A, Floor II), six others over two meters high. No beam holes or sockets located in walls. Length of posts for roof supports (see below) also indicates ceilings at least 2 meters high.

Type.—Known only by inference. A few decayed beams and poles, adobe with impressions, and vertical roof supports suggest that a single large beam crossed one dimension of the room at about the middle, and that smaller secondary members crossed this at right angles, with the ends

FIG. 23. Bin next to south wall of Room 9A, Floor I, Hooper Ranch Pueblo, showing details of construction and stone-slab lining.

of both resting in the masonry of the walls; on top of the secondary poles were splints and then adobe.

Post Roof Supports (fig. 25).—Posts for extra vertical roof support rested in holes located near the middle of four rooms of the lower habitation level (Rooms 2B, 6B, 12B, 4A, Floor II). These posts were from 12 to 15 cm. in diameter and had been broken off at 130 to 148 cm. above the floor. The holes they rested in were 18 to 32 cm. deep.

KIVA I

(Figure 26)

Location.—Centered between unexcavated rooms on the east and west in the south end of the pueblo.

FIG. 24. Rectangular firepit with stone slab sides, Room 5B, Hooper Ranch Pueblo; pot supports inside firepit.

FIG. 25. Firepit, ash pit and post for roof support, Room 6B, Hooper Ranch Pueblo; 50 cm. arrow points magnetic north.

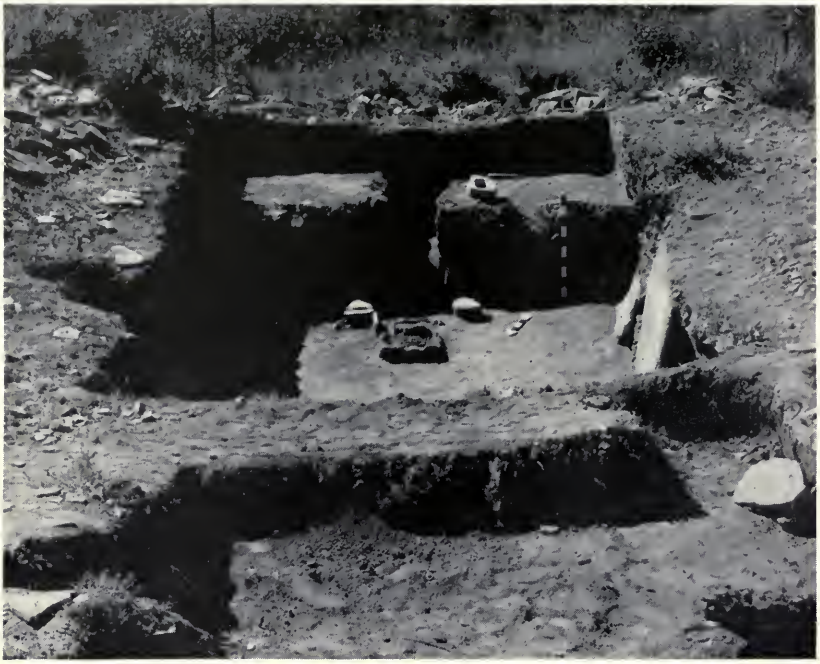

FIG. 26. Kiva I, Hooper Ranch Pueblo, showing firepit, south platform, ventilator tunnel through platform, and grinding stones near ventilator tunnel. Meter stick in background; 50 cm. arrow points north.

Shape.—Roughly rectangular, north wall longer than south wall.

Dimensions.—Length (including south platform), 6.5 meters; width, 4.4 meters (north wall); greatest present height of wall, 154 cm.

Walls.—Of composite masonry, Type I on interior (fig. 27; vertical slab). South platform faced with vertical slabs. Some slabs on edge were quite large; one leaning against west wall was 115 cm. long and 103 cm. wide. Chinked between vertical slabs with small thin slabs, set all around. The mortar was like that of the dwelling rooms.

Plaster.—Three coats of gray, undecorated fine-textured adobe clay, layers 0.2 cm. to 0.5 cm. thick. Preserved only in patches, mostly on the east wall.

Floor.—Layer of compact adobe clay, the surface dark gray, uneven; the two floors were separated in most areas by 5 to 10 cm. of sandy soil. Each layer was medium thick.

Firepit (fig. 28).—Rectangular in shape, sides and bottom lined with stone slabs. Slabs for sides were set on edge and bottom slab was fitted.

FIG. 27. Masonry of Type I (slabs set on edge) in east wall of Kiva I, Hooper Ranch Pueblo. Meter stick at left.

The firepit was filled with fine white ash and bits of charcoal. It was partitioned off from the ash pit by a stone slab. Length, 52 cm. (east and west); width, 48 cm.; depth, 18 cm.

Ash Pits.—Same construction as firepit (see above), but narrower; 41 cm. wide; a secondary slab-lined ash pit, 20 cm. square, adjoins the primary pit on the east side. Both pits were filled with fine white ash.

Damper.—Draft from the ventilator was controlled by a slab set in its mouth. No deflector was found.

Platform.—On south end of room; the wall toward the room was faced with slabs set on edge. Height, 88 cm.; width (north to south), 130 cm.; width (east to west), 423 cm. There was a small area with a flagstone floor near the south wall of the west half.

Ventilator.—A tunnel opening 48 cm. wide at the front of the platform, with side walls of rubble masonry; the tunnel axis was oriented toward the southwest. The roof possibly was made of sticks and clay. The floor, of earth, slopes up; height of wall at outer end, 80 cm. The

outer opening was closed by the north wall of an unexcavated larger kiva. The shaft narrowed to 44 cm. wide near the middle.

Vault.—Roughly rectangular in shape, the sides and ends lined with stone slabs set on edge. Floor of rough bedrock. In the east end was a large black-on-white sherd containing two small tubular bone beads, in the west end a black-on-red sherd containing lumps of yellow pigment. Other lumps of yellow pigment were found in the center of the vault between the potsherds. The vault possibly was roofed with stone slabs (fragments of slabs on top of artifacts). It was located between the firepit and the central niche in the north wall (kachina kihu).

Niches (fig. 28).—Located in north wall. One, 35 cm. square, has stone-slab sides, sill and lintel; passes through wall and under platform of Kiva II; about 30 cm. above floor and 45 cm. east of northwest corner. The second niche, located near the center of the north wall, 20 cm. above floor level, is also lined with stone slabs; the side of the niche facing the kiva is made of a small semicircular slab with a hole through the center. Height of niche, 12.0 cm.; width, 18.0 cm. In line with ventilator, firepit and vault.

Roof.—No evidence.

Artifacts.—A large heavy metate embedded in floor east of ventilator opening; a large circular matching stone west of opening. Pipe mold in ventilator tunnel on floor. Two painted slabs with smooth surfaces covered with red paint, one on floor 50 cm. east of firepit, the other, in line with the first, east of the vault.

KIVA II

(Figure 29)

Location.—Centered between rooms on the east and west, in the south end of the pueblo. Kiva I adjoins it on the south, Room 4A on the north.

Shape.—Rectangular; main floor area nearly square.

Dimensions.—Length (including platform), 4.1 meters (east and west); width, 3.8 meters; greatest present height of wall, 170 cm.

Walls.—Slabs set on edge at base of north and east walls; above this course some banded masonry (Type III). South wall and west wall (above platform) of rubble masonry (Type II) built up of small slabs. The platform was faced with vertical slabs at base; rubble masonry above. The mortar was both gray and brown, sandy and fairly hard.

Plaster.—Two layers of plaster, both undecorated, gray on the surface, brown underneath; each about 0.2 cm. thick.

FIG. 28. Central portion of floor and north wall of Kiva I, Hooper Ranch Pueblo, showing firepit, foot-drum type vault, and kachina niche. Meter stick in background; 50 cm. arrow points magnetic north.

Floor.—Composed of flagstones based on sand above bedrock, or clay and sand mixed. These stone slabs range in size from small (17 cm. long, 15 cm. wide) to large (132 cm. long, 122 cm. wide). The slabs were fitted like a mosaic.

Firepit and Ash Pit.—Rectangular; the ash pit almost square. The firepit was lined on the sides with slabs set on edge; the bottom was bedrock. The ash pit was of the same construction but lacked slabs on the side toward the ventilator. Both pits were filled with fine white ash. Dimensions of firepit: Length, 50 cm.; width, 40 cm.; depth, 20 cm. Dimensions of ash pit: Length, 54 cm.; width, 51 cm.; depth, 20 cm.

Damper.—A small thin slab found near the ventilator opening may have been used to control the draft. There was no deflector.

Platform.—In west end of room; the front wall was faced with neat masonry of vertical slabs. The floor was adobe clay. Height, 56 cm.; width at south end, 112 cm.; width at north end, 105 cm.

Ventilator.—A horizontal shaft through the center of the platform to a chimney-like vertical flue. The opening in the front of the platform, about 50 cm. wide and 30 cm. high, was framed by a horseshoe-shaped ring slab. A vertical shaft built out from the wall enclosed the flue, 18 cm. in diameter. A horizontal shaft, 86 cm. long, had walls of rubble plastered with adobe clay. A series of awl-sharpening marks on the lintel of the shaft opening.

Roof.—Beams or poles were found crossing the short dimension of the room. There was no other evidence.

Artifacts.—Circular metate-like grinding stone embedded in adobe floor to north of ash pit and ventilator opening. A large flagstone in the northwest quadrant had a grinding surface and a large spot of red pigment on the under side. Red pigment, blue pigment, and a piece of obsidian were found under other slabs.

GENERAL ARRANGEMENT OF PUEBLO PARTS

We estimate that the pueblo contained about sixty rooms in the upper habitation level. There appeared to be a similar number of rooms in the lower habitation level, but of course these rooms were buried, and an estimate of the outer limits of the lower building is probably inaccurate. Test trenches, an irrigation ditch cut and a road cut on the perimeters of the ruin gave us a fairly accurate idea of the extent of the later structure.

Certainly the upper habitation level was an extensive cluster of rooms. The south end of this building apparently had the rooms grouped on three sides of the kivas that were excavated. Thus the two kivas formed an enclosed courtyard or plaza surrounded by rooms; the ground plan

FIG. 29. West end of Kiva II, Hooper Ranch Pueblo, showing firepit, ash pit, platform and ventilator complex; 50 cm. arrow points magnetic north.

is reminiscent of Kinishba and other plaza type pueblos (Cummings, 1940, map).

Sequence of Construction.—All of the floors and many of the walls of the rooms classed as upper habitation level rooms (Rooms 1A, 2A, 3A, Floor I, 4A, Floor I, 5A, 6A, 8A, 9A, Floor I, 10A, Floor I, 12A and Kiva II) were stratigraphically above those of the lower habitation level (see figs. 13 and 30), and it is therefore certain that these upper floors and rooms are of later construction. However, the sequence of construction for rooms within each of the major periods is somewhat doubtful because it is based on two assumptions: (1) that walls which are bonded together were built at the same time; (2) that walls built with one face of neat-appearing Type I (vertical slab) or Type III (banded masonry) were at first exterior walls with the neat-appearing face exposed and that any abutment which hides the neat-appearing face ends a wall of later construction. (The corollary of this is that walls with faces of crude rubble masonry (Type II) were at first interior walls and the faces were covered with plaster.) Furthermore, additional doubt is cast on the sequence by the difficulty of accurately identifying some bonds in this architecture. For example, in most instances the stones of the two walls at a corner were found to be bonded in only a few courses, or, more frequently, thin, flat pebbles or small thin slabs had been pressed into the wet mortar diagonally across the corner where the walls met, and the joint had been "cemented" together with a covering layer of adobe mortar. This formed a bond (fig. 31) similar to the "diagonal bonding" found at Lowry Ruin (Martin, 1936, pl. 25). Fortunately, abutments (fig. 32) were a more common form of wall juncture and are easier to identify accurately.

On the basis of the evidence afforded by the bonding and abutments a possible sequence was worked out. Floor III at the bottom of Room 3A was probably built before any other floor. The pottery on this floor was the earliest in the pueblo and the hearth was partly covered by later walls. We found no other rooms as early, and there is probably an interval between this construction and that of most of the rooms in the lower habitation level such as Rooms 6B and 12B, which probably belonged to a nuclear unit. The next addition was Room 1C and probably the adjacent rooms in a row extending east and west. Another row was then added consisting of Room 1B and adjacent rooms. Construction of this second addition was followed by a third row made up of Rooms 3A, Floor II, Rooms 5B, 2B, 4A, Floor II, and 9A, Floor II. After that row had been completed still another was built against it on the south, including Rooms 7A and 10A, Floor II, 15A (before it was remodeled

FIG. 30. Room 6A, Hooper Ranch Pueblo, in foreground; its southwest corner is built on top of north half of Room 1C, right. Meter stick for scale; 50 cm. arrow points magnetic north.

FIG. 31. Diagonal bond, northwest corner of Room 2B, Hooper Ranch Pueblo. Height of wall above pit, 155 cm.

FIG. 32. Abutment to left of meter stick in northeast corner of Room 1B and continuing up into center of east wall of Room 1A, Hooper Ranch Pueblo.

into Kiva II), and probably Room 14A. With the possible exception of Rooms 7A and 14A the above rooms were part of the lower habitation level.

There followed a period in which the upper habitation level was constructed. All the walls, roofs, and central roof posts in the north end of the pueblo and a number of partition walls and posts in the south end were razed to about 150 cm. above the floor, and the compartments

formed by the walls of the old rooms were filled with relatively clean fill, on which new plastered floors and hearths were built. In the south end of the pueblo new construction was confined largely to alterations; some of the old walls were used and only a few new walls were built on fill. In this area the new wall junctures can tell us nothing about the sequence of the later construction. In the north end of the pueblo the rooms are entirely new; the walls do not coincide with the old walls, and the bonding and abutments suggest that the new construction advanced in the opposite direction to that of the earlier structure—from south to north rather than from north to south—Room 1A first, then Rooms 6A, 8A, and 12A in that order. Room 15A was probably remodeled into Kiva II at this time by the addition of a platform, a ventilator, a firepit, an ash pit, and a flagstone floor. Room 13A was constructed at the same time as Room 9A, Floor I. Kiva I was probably built at the same time as Room 15A. Rooms 11A, 14A, and 17A were not completely excavated and cannot be placed in the sequence of either level.

USES OF ROOMS

The larger rooms, which contained firepits and also almost always held more artifacts, were probably dwelling rooms.

The smaller rooms, without firepits and generally containing fewer tools and chipped flint, were probably storerooms. In one of these, Room 10A, there was a quantity of charred foodstuffs on the floor; it was the only room (other than Kiva II) partially paved with flagstones.

The kivas were identified as such by their resemblance to historic western pueblo kivas (Mindeleff, 1891, pp. 122–129; Parsons, 1936, fig. 385). The platform, ventilator, ash pit, firepit, sipapu or vault, north wall niche (kachina kiku) complex includes most of those features which are also found in historic kivas. The flagstone paving of the floor in Kiva II, the size of Kiva I, and the grinding stone near the ventilator are other architectural features in which they resemble other kivas and differ from the rooms. The caches of pigments, beads and pipe mold, the painted slabs and their position, and the metate-like stones in position, also suggest the use of these structures as kivas.

PICTOGRAPHS

(Figures 33–35)

A series of pictographs resembling reptiles, animals, men, and a bird had been pecked into the soft sandstone of one of the walls of the pueblo. Another pictograph, by itself in another room (Room 4A, Floor II, but

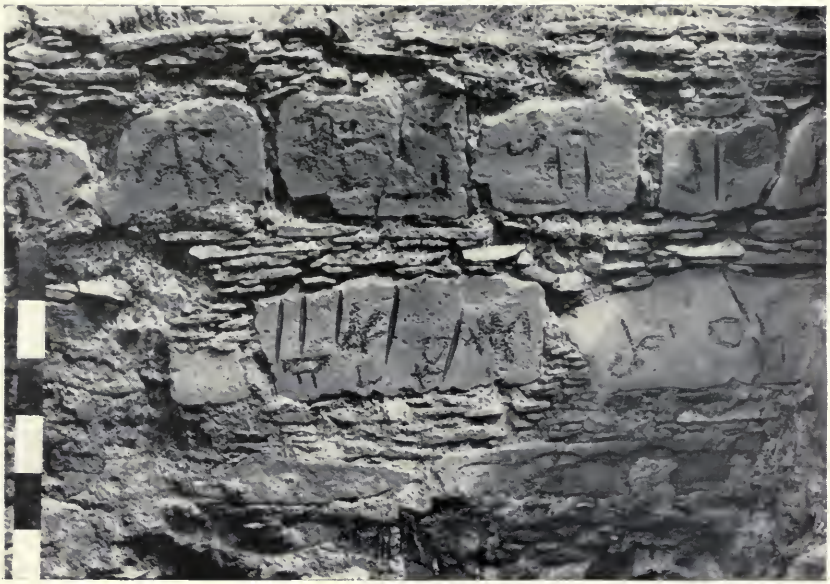

FIG. 33. Panel of pictographs on north wall of Room 3A, Hooper Ranch Pueblo. Meter stick at left.

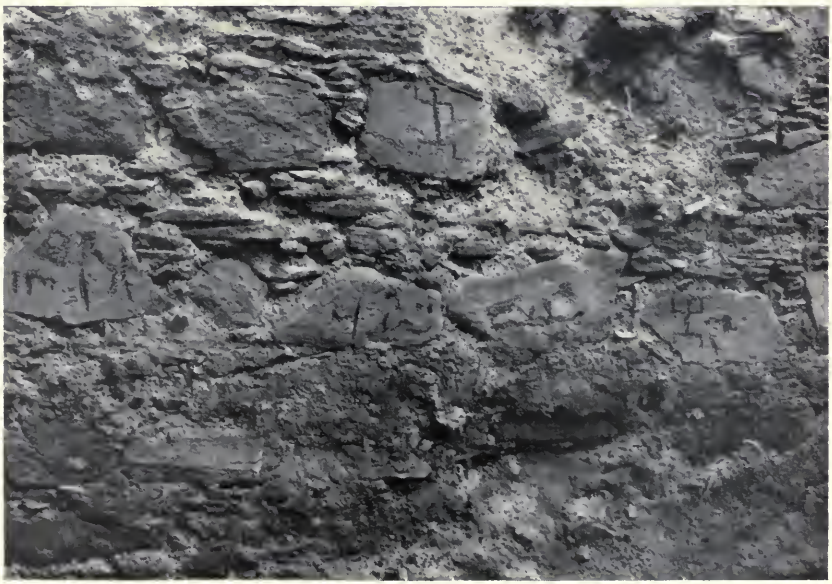

FIG. 34. Panel of pictographs on north wall of Room 5A, Hooper Ranch Pueblo. Same scale as Fig. 33.

FIG. 35. Geometric pictograph on wall stone from fill in Kiva I, Hooper Ranch Pueblo.

on the same wall), is a series of chevrons incised on a single slab, possibly with a bone awl since there are numerous awl-sharpening grooves in this wall. Still another geometric figure on a wall stone was found loose in the fill of Kiva I, but this design was pecked, possibly with a hammerstone.

Except for these two geometric designs all the pictographs were on the north side of Room 3A, Floor II, and Room 5B, where they appear in three courses of stones and present what seems to be a panel planned in advance. They were all pecked in sandstone of approximately the same tan color, and there was no contrast in tint between the pictographs and the surrounding stone at the time of excavation. They range in size from 7.5 to 25 cm. long and are proportionately wide.

Many of the figures represented are virtually impossible to identify. There are some that are simply awl-sharpening grooves, and others may be random cavities pecked in the rock. Many symbols cannot be interpreted, although it seems certain that they were intended to represent specific shapes, because they lack certain essential attributes or combine more than a normal number of features. They may be birds, animals, or possibly reptiles, depending on one's point of view.

A number can be classified, as they follow a relatively standard pattern (fig. 34). These have a straight groove for a body, with a round dot

at the upper end for a head; the limbs extend out from the upper and lower extremities of the body at right angles and are bent in another right angle. Some have tails (or genitals?) between their lower limbs. Two appear to have arrows pointing at their feet. Similar representations have been identified by the Hopi for Colton (1946b, figs. 2 and 4) and for Fewkes (1897, pl. 4, fig. 104) as lizards or reptiles, whereas M. Stevenson (1904, pl. 7*c*) was told by the Zuni that this represents a "primitive Zuni before amputation of tail."

A few others conform to patterns with a possibly greater degree of probability. There are a snake, a bison, and a bird. These have certain features which identify them.

Similar symbols have been termed totemic signatures by Fewkes (1897) and Colton (1946b) for the Hopi and by Stevenson (1904) for the Zuni and it is quite possible that these figures represent something of this kind. Other possibilities, although less likely, are (1) that they were simply decorative; (2) that they record an event or series of events in the manner of Plains Indian pictographs; (3) that they were regarded as having a magical or ritual significance.

Aside from their meaning to the former occupants their definite association with a particular culture seems worth mentioning. At least two styles and two processes of making them are represented, and there is the possibility that they were made by another group and quarried ready-made. Nevertheless it is clear that this group of pictographs had meaning to this particular culture.

GENERAL COMMENTS

The Hooper Ranch Pueblo contained perhaps sixty rooms and three kivas that were occupied at one time. The building was probably one story high. Many of the rooms were used as dwelling rooms (eleven large rooms with firepits were excavated), but some of the smaller ones were probably used for storage. During one period in its history most of the pueblo had been rebuilt on top of the filled-in rooms of an earlier period. In some of these earlier rooms, tools, pottery vessels, and other artifacts had been left intact on the floors around the firepits.

The two kivas appear to be closely related to other rectangular kivas of this general time level, and they also are remotely related to kivas in general in that they fulfill Smiley's (1952, pp. 22–23) definition of a kiva, since they possess "a ventilator, a firepit, a hatchway over the firepit, and one or more of the following features: deflector, ash pit, sipapu, bench, platform, recess, wall niche, loom anchor, and either subterranean or ground level placement." In addition to the essential features

such as a ventilator, a firepit and probably a hatchway over the firepit, the two kivas at the Hooper Ranch have ash pits, platforms and subterranean placement with reference to the filled-in rooms of the lower habitation level. In Kiva I there are also a wall niche and a vault which may have functioned as a sipapu. In Kiva II there are two notches in the edges of the flagstones near the firepit (one was located on the north, the other on the east), but it is uncertain whether these were loom anchor holes, or places for the insertion of interlocking stones to keep the flagstones from shifting, or whether one of them functioned as a sipapu.

The two kivas appear to be closely related to other rectangular kivas in this area because of the similarity in a number of features. The vault in Kiva I seems to have some analogy to the groove on the west of the hearth area in the Great Kiva at Mineral Creek Site (see p. 26) or the similar feature in Kiva B at Kiatuthlanna (Roberts, 1931, p. 98). The vaults are long, narrow trench-like depressions and are situated athwart the ventilator-hearth axis of the kivas on the opposite side of the hearth from the ventilator (or lateral entrance). Vaults of similar shape and in a similar position occurred in the kivas excavated by Smiley (1952, pp. 39, 47) at Point of Pines and they are also found in historic kivas such as the chief kiva at Shipaulovi (Mindeleff, 1891, fig. 22, p. 122).

The position of the painted stones found in the floor to the east of the firepit and the vault in Kiva I at the Hooper Ranch Pueblo are also suggestive of the position of some of the painted stones found in the Great Kiva at Higgins Flat Pueblo (Martin, Rinaldo and Barter, 1957, p. 58). These painted stones are also suggestive of the "tiles" which historic Hopi use on their altars (Smith, 1952b, p. 262), but this relationship is only very general.

The pattern of flagstones in Kiva II appears to be something like that in certain historic Hopi kivas such as the low kiva at Shipaulovi (Parsons, 1936, p. 722). It is less like that of the flagstones in Kiva II at Table Rock Pueblo (Martin and Rinaldo, 1960b, fig. 79) or that in the rectangular kiva at Hawikuh (Hodge, 1939, fig. 2) in that the flagstones are not as uniformly rectangular in shape and the layout is asymmetrical. There is a possible parallel between all four patterns in that the largest flagstone in Kiva II at the Hooper Ranch is placed in the center of the floor next to the east wall where an altar would be placed—the front of the kiva, in Smith's terminology (1952b, p. 6). This unusually large flagstone seems analogous to the long narrow slab in front of the kachina niche in Kiva II at Table Rock Pueblo and a similar long narrow flagstone in the north end of the kiva at Hawikuh.

The grinding stones found near the firepits and ventilators in both kivas at the Hooper Ranch Pueblo seem to have their analogues in grinding stones found in a similar position in some of the Point of Pines kivas (Smiley, 1952, pp. 25, 36, 47), and at Pinedale (Haury and Hargrave, 1931, p. 51).

An Inquiry Concerning Vaults, Sipapus and Grooves

In the Mogollon area many of the earlier pithouses which have been called Great Kivas contain grooves in the floor. These grooves are trenches in a quadrangular arrangement so located as to appear to have some symbolic relation to the hearth. Their actual function has not been determined but it has been suggested theoretically that they contained some sort of foot drum (Wheat, 1954, p. 73). The grooves appear in the following houses which have been termed "kivas" or "ceremonial rooms": Pithouse A at the SU Site (Martin and Rinaldo, 1940, Map 4); House 5 at the Bluff Site (Haury and Sayles, 1947, fig. 5); Pithouses 9 and 19 at Crooked Ridge Village (Wheat, 1954, figs. 24, 25); Pithouse K at Turkey Foot Ridge (Martin and Rinaldo, 1950a, fig. 101); and at the Bear Ruin Kiva (Haury, 1940, fig. 19). On a later horizon the grooves appear in the earlier Great Kivas at the Sawmill Site (Bluhm, 1957, fig. 3) and at the Higgins Flat Pueblo (Martin, Rinaldo and Barter, 1957, fig. 2), and in a still later horizon in the upper structures at both these kivas.

Pithouse A at the SU Site has a series of grooves encircling the floor. House 5 at the Bluff Site has a continuous groove in the bedrock encircling the perimeter of the floor in a similar manner. The five grooves in Pithouse A have the shape of a half log and may have contained hollow logs to be used as foot drums or solid logs for the bases of roof supports. The grooves in both houses are set out from the wall a very short distance and appear to outline an area of the floor space; but for the most part there is no room to stand between the groove and the wall so it does not seem likely that they were used in ceremonies to separate participants from spectators.

Pithouses 9 and 19 at Crooked Ridge Village and Pithouse K at Turkey Foot Ridge illustrate the next stage in the developmental sequence (although Pithouse K was of later construction). In these houses a central area of the floor surrounding the hearth area is set off by grooves which form a quadrangle. Actual remnants of logs were found in the grooves in Pithouse K. They enclose an area much smaller than that in the earlier houses and may have served either as a visual boundary between the surrounding space and the hearth area or as the basal support for a physical barrier which performed a similar function. Again, the logs could have been hollow and served as foot drums.

Up to this point the grooves always seem to have formed a boundary around an area, although in three out of the five houses there have been gaps in the boundary. Then, there are indications of a shift in emphasis. The Bear Ruin Kiva, for example, has a long groove set athwart the axis between the southeastern recess and the hearth, at the far side of the hearth. Haury has suggested that this groove and the associated notches on its periphery were part of a loom anchor (Haury, 1940, p. 47). This may have been so, but the position of this groove is similar to that of the sipapu vaults in Kiva B at Kiatuthlanna, at Point of Pines (e.g., Kiva 1, Ariz. W. 10: 48; Smiley, 1952, p. 39), and in some historic Hopi kivas (Mindeleff, 1891, fig. 22) (see p. 57), even though there is another depression beyond this which Haury designates as possibly a sipapu.

The next stage in the development is represented by the Sawmill Site Great Kiva and to a lesser extent by the Great Kiva at Higgins Flat Pueblo. In both of these kivas the hearth area is bounded on opposite sides by grooves and in addition in the Sawmill Site by deeper pits that Bluhm has conjectured may have been resonators (Bluhm, 1957, p. 27). There appears to be a distinct resemblance between the placement of these grooves and the central post of the hearth area and the quadrangular arrangement in relation to the hearth noted in the kivas at Turkey Foot Ridge and Crooked Ridge Village. At Higgins Flat Pueblo, however, the hearth area is bounded by grooves only on the north and south and there was a large round depression on the west beyond the hearth area.

The Great Kiva at Mineral Creek Site (see pp. 23–29) has a hearth area similar to that in the Great Kiva at the Sawmill Site in that both hearths are bounded by vaults and grooves, but in the former instance the vaults are lined with stone slabs. These vaults appear to have parallels in the masonry vaults situated between the pillars in Anasazi Great Kivas (see p. 29); possibly both may have been used as "resonators."

The west vault at Mineral Creek Site seems to provide a link between the vault or trench situated to the north or west of the hearth area in the earlier lesser kivas and the vault of the foot drum type found in Kiva I at the Hooper Ranch, in the kivas at Point of Pines (Smiley, 1952, pp. 39, 47), and in some of the historic Hopi kivas. At the same time the relatively narrow area between the grooves and the walls in most of the earlier Mogollon Great Kivas suggests the narrow bench which is found on three sides of some historic Hopi kivas, especially so if the groove-to-wall area is compared with the wider area of the ramp entryway and the bench to the more spacious southern platform. Thus the Great Kiva at Mineral Creek provides a link in the development of lesser and Great Kivas in the Mogollon area.

SUMMARY OF ARCHITECTURE OF BOTH PUEBLOS

Six dwelling rooms and a Great Kiva were excavated at Mineral Creek Site on the west bank of Mineral Creek two miles east of Vernon, Arizona. The secular rooms were all roughly rectangular in shape with walls of rather crude, composite masonry. There were no lateral doorways and entrance was possibly through a hatchway in the roof. The interior walls were plastered. The rooms had either a central firepit of general oval shape or a central posthole which probably once contained the secondary vertical support for the main roof beam. One room contained a ventilator in the partition wall, and centered and in line with the ventilator opening were a stone-rimmed firepit and three bins with bottoms and walls of stone slabs.

The Great Kiva was generally round in shape with walls of native gravelly earth covered with a coating of mixed adobe and sand. A short, steep, lateral entryway was located near the center of the east side. Four posts symmetrically placed served as the main supports for the roof. Long, narrow, trench-like vaults lined with stone slabs were placed between the holes for these posts on the north, south, and west sides of a central hearth area and between the postholes. A short groove connected the north and south vaults to the northeast and southeast postholes. In the arrangement of the primary postholes, the vaults, and the grooves there appear to be certain analogies to the disposition of similar features in other Great Kivas in both the Mogollon and the Anasazi areas.

Twenty-five secular rooms and two kivas were excavated at the Hooper Ranch Pueblo, which lies on the east bank of the Little Colorado River approximately four miles north of Springerville, Arizona. This pueblo was of roughly rectangular shape with the three kivas (one not excavated) situated on the south end and disposed in a row trending north and south. The two smaller excavated kivas lay between secular(?) rooms on the east and west.

Both the ceremonial and the secular rooms were rectangular in shape. The secular rooms and one of the kivas contained about nine square meters of floor space on the average. The other excavated kiva was much larger. Many smaller secular rooms were also excavated. The larger rooms were usually furnished with rectangular stone-slab-lined firepits. Walls were generally of three types of masonry: (1) with a facing of slabs set on edge; (2) constructed throughout of a rubble consisting of slabs and chunks laid up in abundant mortar; (3) faced with banded masonry built up of a series of large long slabs laid in courses alternating with a larger number of courses of thin slabs. Most of the rooms were plastered, but the walls

were not painted. One long wall contained several panels of pictographs, depicting mostly natural forms, inscribed and pecked in the masonry.

Two habitation levels were uncovered. The walls of the upper habitation level were based on the filled-in lower portions of the earlier rooms in such a way that the walls of the two levels did not coincide in most instances. The walls of the rooms in the lower habitation level were pierced by rectangular doorways and contained niches. A few of the rooms in the upper level were furnished with bins and ventilators. No lateral doorways were found in the rooms of the upper habitation level, and they must have been entered through hatchways in the roofs.

The evidence for roof construction consisted of decayed roof members found in place and in impressions on adobe. This indicated that one or more large beams crossed the center of the room and had their ends resting in the masonry; in the lower habitation level they rested also on a post placed near the center of the room. Successive layers of poles, splints, and adobe were supported by the main beams.

The smaller rooms contained charred corn and other vegetable remains and miscellaneous stone and bone artifacts, but there were no furnishings such as firepits or ventilators and the rooms were probably storerooms.

The ceremonial rooms were characterized by such typical features of late rectangular kivas as platforms, flagstone floors, and kachina niches. One of the kivas had a foot-drum type of sipapu. A conjectural development may be traced between these vaults and certain grooves and vaults in early Mogollon Great Kivas.

III. Artifacts from Mineral Creek Site and Hooper Ranch Pueblo[1]

More than 1200 stone, bone, shell, and minor baked clay artifacts were recovered from the Hooper Ranch Pueblo and Mineral Creek Site. More than a thousand of these objects were excavated at the Hooper Ranch, and the remainder came from Mineral Creek Site. As in most other Southwestern sites, stone objects outnumbered those of other materials. Although there are some differences between the assemblages from the two sites, the similarity is remarkable considering the more than twenty miles of rough terrain that separate the two sites, and the interval of many years between the time when each was occupied. Most of the artifacts found at the Hooper Ranch have their counterparts in the collection from Mineral Creek Site but in smaller numbers. For this reason the two collections will be discussed together.

Some of the main interests in the study of the artifacts were to determine (1) how they were made, (2) how they were used, (3) which ones were objects of trade, (4) the amount of help they would give in placing the sites in a specific cultural tradition and in an interval of time within this tradition.

GROUND AND PECKED STONE ARTIFACTS

A large proportion of the stone artifacts from the two sites had been shaped to some extent by grinding and pecking. These objects show the characteristic scratches which indicate that they were ground on an abrasive gritty surface, and the small pits where they were struck with a pecking stone. All of the tools sometimes termed handstones, such as manos, rubbing stones and pestles, had been shaped in this way, as well as the metates, lapstones and mortars. Furthermore, many of the manos were thus modified not only on their working surfaces but on their ends, edges, and other surfaces as well.

In general, although they are more carefully shaped than the objects from the earlier Site 30, excavated in 1957, the artifacts from the Hooper

[1] A tabulation of dimensions, materials, and proveniences for specific artifacts has been given by Martin, Rinaldo, and Longacre (1960).

Ranch are less carefully shaped than those from the Table Rock Site, where the manos, for example, are more consistently shaped all over and have square corners and straight edges.

A number of symmetrical stone slabs of mano shape and size were found. Their surfaces did not show the usual marks of use and they were termed mano blanks. The edges of some had been shaped by spalling, others by grinding and pecking. Their broad surfaces are uneven and follow the natural cleavage planes of the bedrock or boulder from which they were split.

Some of the rubbing stones, pestles and polishing stones are natural pebbles modified only on their used surfaces.

Hammerstones, abrading stones, old axes and mauls were probably used to shape artifacts of stone.

POLISHED STONE ARTIFACTS

A few of the categories of artifacts such as axes, arrow-shaft tools, and ornaments, have polished surfaces which are smooth and reflect light. With the exception of some beads, a pendant and an arrow-shaft tool, all of the polished stone objects are from the Hooper Ranch Pueblo. The polished surfaces are few. They include the blades of about half of the axes, and the grooves of one of the axes, one of the mauls, and all of the arrow-shaft tools. Some other surfaces on about half of the arrow-shaft tools had also been polished. In general, polished surfaces are less common in the Hooper Ranch Pueblo artifacts than they are on the Table Rock Pueblo artifacts. It was not a common technique for working stone at either site.

At the Hooper Ranch Pueblo there were numerous grooved slabs of fine-grained sandstone which appeared to have been used for polishing and sharpening axe blades.

CHIPPED STONE ARTIFACTS

The majority of the chipped stone tools were small objects made from flakes. Many were merely flakes which had been sharpened for use but there is a continuous gradation between such utilized flakes and blades with secondary chipping on all their major surfaces. There is also a gradation from crude percussion-flaked implements such as the choppers into the more finely chipped scrapers. Although the more crudely shaped chipped tools are in the majority, a large number of small, thin, delicately flaked projectile points were recovered.

Hammerstones and flakers of bone and antler such as were found in some of the rooms were probably used as chipping tools.

On the whole this was not as popular a technique for shaping stone as grinding and pecking. There are more ground and pecked artifacts than chipped stone artifacts from the Hooper Ranch Site. However, there are more chipped stone artifacts from the Mineral Creek Site.

SHELL OBJECTS

A number of shell objects were found but they are not especially elaborate. The principal techniques used in working shell were cutting, sawing, grinding, polishing, and drilling. Cutting and sawing are indicated by minute parallel scratches and notches on some surfaces. Polishing probably produced the lustrous surfaces and drilling made the conical holes.

Beads and bracelet fragments were the objects most frequently recovered. The beads were made by cutting or grinding off the spire of the olivella shell, and the bracelets were made by cutting out the centers of larger bivalve shells and grinding the thin remaining sections smooth.

Two incised pendants were found. These have simple straight grooves incised in them, probably for decoration. No carved forms were found.

Strangely enough almost nothing was made from the thin, native freshwater clam shell, although these were found in almost every room. The ornaments were made from shells which were traded in.

BONE OBJECTS

Tools and other objects of bone were especially numerous at the Hooper Ranch Site, although the number of forms in which bone was used is not much greater than at other contemporary sites.

Awls were so numerous that weaving and allied occupations must have been especially important at the Hooper Ranch Pueblo. There are few elaborately worked forms, and relatively few that have been polished and worked all over. The usual treatment of the bone after it had been split or splintered was to make it into a serviceable implement by paring it to a point and grinding and polishing it down farther, probably on an abrasive stone. Awls with the head of the bone intact, those on which the head of the bone has been split in two, and splinter awls are the dominant types.

There appears to have been a consistent effort to retain the end of the awl opposite the point as a sort of handle. Either the head was left intact, or nearly so, and was used as a knob-like handle, or it was blunted and rounded off so that it was a comfortable place to grasp. Also, the shaft of

the bone was usually ground off so that there were no sharp edges left from the process of splitting.

Grooves which tapered at each end were found in the sandstone walls of the pueblo, and these are thought to be awl-sharpening grooves. A few portable grooved abrading stones were found which may have served the purpose.

BAKED CLAY ARTIFACTS

Aside from the pottery vessels (described in chapter IV), the baked clay artifacts consist of worked sherds (fig. 36), an animal effigy, and a pipe.

The worked sherds were probably shaped by rubbing the edge of one pottery fragment against another until the desired outline was secured and the fragment was abraded smooth. The animal effigy was modeled in a crude fashion while the clay was still plastic and wet. The legs appear to have been drawn out of the original lump, not attached. The body is smoothed but not polished or slipped.

The pipe was probably made in a mold, because in shape it conforms to the general contour of two stone objects (fig. 37) containing subconical cavities roughly the shape of the pipe. We reason that a lump of wet and plastic clay was pressed into the mold, a bowl hollow pressed in one end and a stick thrust through at the "stem" end. Then the pipe was left to dry and shrink so that it would drop out of the mold. When it had dried it was polished and slipped with a fine white slip; then a red brown decoration was added with paint probably made of an iron pigment.

THE USES OF ARTIFACTS

Tools Used for Grinding

Manos, metates, rubbing stones, mortars, pestles and some of the hammerstones were probably used for grinding purposes—primarily for milling corn and seeds and secondarily for grinding paints.

Rectangular manos (fig. 38) with flat or beveled grinding surfaces, probably used on a flat or slab-type metate, were the most common. We recovered relatively fewer manos with convex grinding surfaces for use on a trough-type metate. About one-fourth of the collection had beveled grinding surfaces. Those from the Hooper Ranch Pueblo were on the average thinner than those from Mineral Creek Site. A number of the thicker specimens were pitted on the top surface or grooved on the edges in order to furnish a grip. About ten manos (fig. 39) had red, green, or black pigment on one of their broad surfaces. On some of these objects

FIG. 36. Worked potsherds, miniature ladle fragment, and animal effigy fragment. Length of lower left specimen, 9.1 cm.

the pigment was limited to a small smudge; on others it covered the entire surface and seems to indicate that they were used for grinding paint.

The smooth-worn or striated surfaces of the rubbing stones (fig. 40) are enough like those of the manos to suggest that they were used as small

FIG. 37. Pipe mold and grinding stones. Length of lower right specimen, 13.3 cm.

manos. They were differentiated from the one-hand manos simply on the basis of size.

Some pestles (fig. 41) of the multifaced type also appear to have been used as manos. These implements have some smooth facets which appear to have been used for grinding by abrasion, and of course they have pitted, battered ends which have been used for pounding.

The hammerstones (fig. 42) were probably tools with multiple uses. They are usually made of dense, flinty rocks, and range in shape from

FIG. 38. Manos, miscellaneous types. Length of lower right specimen, 20.1 cm.

FIG. 39. Painted manos and an early type of mano (lower right specimen; length, 12.7 cm.).

FIG. 40. Rubbing stones. Length of lower left specimen, 8.9 cm.

angular fist-sized stones to smoother round pebbles from which most of the corners have been removed. These implements were probably used as pecking stones to roughen the grinding surfaces of the manos and metates, and as pestles for pulverizing material in mortars and for knocking flakes off cores in the process of percussion-chipping.

Most of the metate specimens from the Hooper Ranch Pueblo were fragments. More than half of these were from flat (fig. 43, right) or slab type metates, four were definitely from trough type metates, and two were from shallow basin type metates (fig. 43, left). The remainder—about a dozen specimens—were too fragmentary to classify accurately but most of them appear to come from metates with a shallow grinding surface. The metates from Mineral Creek Site were all of the type with trough open at both ends.

A number of small metate-like grinding stones (fig. 44) were found at the Hooper Ranch Pueblo. Most of these are shaped liked miniature metates and may have been used as toy metates. Others have more than one grinding surface—two or three parallel troughs containing pigment in two instances— and these were probably used for grinding paints.

The small metate-like grinding stones grade into a crude form of paint palette (fig. 45). These are simple, small, rectangular or circular slabs of

FIG. 41. Abrading stones (upper) and pestles (lower). Length of lower left specimen, 10.5 cm.

stone with smudges of paint on one or two broad surfaces. Sometimes the surfaces bearing paint are smooth.

Red (hematite), green and blue (malachite, azurite, turquoise), yellow (limonite), white (kaolin?) and black pigments were used. Most of the lumps of hematite and a few of the malachite and limonite samples were faceted, as if the raw pigment had been rubbed directly on the grinding stone or palette; that is, it had not been broken off and pulverized.

In general the mortars are of two types: (1) medium-sized slabs with shallow cavities a few centimeters in diameter in the middle or with one on opposite surfaces; (2) thicker stone vessels with larger, deeper, cup-like depressions in one face (figs. 46, 47). The former may have been used as nutting stones as well as mortars. There were no traces of paint in their walnut-sized cavities, and walnuts were plentiful in the rooms where they occurred. At least some of the latter (bowls) have traces of pigment in their cup-like depressions and were almost certainly used for grinding paint.

FIG. 42. Hammerstones (right), handstones (middle), mortar and celt (left). Length of lower left specimen, 11.7 cm.

TOOLS USED FOR POUNDING AND CHOPPING

The mauls, axes, and choppers were probably used for working up wood and possibly for shaping some of the softer rocks. Only one of the axes (fig. 48) has a sharp blade; the other ten have been broken or blunted by use on some hard rock. Most of the mauls (fig. 49) have flat or blunt faces and thick ends which appear to have been designed for pounding and which in some examples are battered from use on a harder rock. Apparently they had been used for breaking up wood and rock. None of the mauls had smooth-faceted grinding surfaces and they do not appear to have been utilized as manos, but they may have been used as pestles. One of them is very symmetrical and rectangular in shape, like an abrading stone, and has only a very shallow groove.

The choppers (figs. 50 and 51) show little evidence of wear. One or more surfaces were percussion-flaked to form a sharp cutting edge, and in addition there was some secondary chipping which made a keener edge. Part of the original, smooth surface of the stone was left intact for a grip. These tools probably were used for chopping wood and breaking up bones. This postulated use rests on evidence found at Tularosa Cave

FIG. 43. Metate (right) with flat grinding surface; length, 48.8 cm. Metate with basin-shaped grinding surface; length, 51.2 cm.

(Martin *et al.*, 1952, p. 107), where choppers had bits of tissue adhering to their edges.

OPENINGS CLOSED WITH WORKED SLABS

The large rectangular and circular worked slabs (fig. 52, left) were probably used as "doors" for closing hatchways, lateral doorways and ventilator openings. Although none were found in place at the Hooper Ranch Pueblo or Mineral Creek Site they are so much like those from Foote Canyon Pueblo (Rinaldo, 1959, pp. 173, 244) and Valley View Pueblo (Martin, Rinaldo and Barter, 1957, p. 58), which were found in ventilator openings, that there seems little doubt that these slabs served a similar purpose. None of them had the burned surfaces which would indicate their use as piki slabs.

A few ring slabs (fig. 52, right) and fragments thereof were recovered. Two of these were in place—one in the mouth of the ventilator tunnel in Kiva II, Hooper Ranch Pueblo, and another in the niche at the north end of Kiva I (kachina kihu?). Both slabs are relatively small. The one in Kiva II was more nearly the shape of a horseshoe, and that in the niche had quite a small hole. Larger ring slabs may have been used to frame hatchway openings (Mindeleff, 1891, pp. 192–194, pl. C).

Tools Used for Abrasion

Some thick, generally oblong objects (fig. 41) made of pumice or light vesicular basalt resemble small manos or rubbing stones but they lack the smooth or striated grinding surfaces usually found on manos and are too light in weight to make efficient crushing tools. They range from quite symmetrical rectangular objects with square corners and flat surfaces to specimens with more rounded contours. Similar objects were recovered at Los Muertos, and, following Haury's theory (1945, p. 129, pl. 40), we conjecture that the rough surfaces of these stones made them useful abrading tools.

Other small oblong tools made of gritty stone have a single groove (fig. 53) in the approximate center of a flat upper surface running parallel to the long axis. Most of them have grooves of uniform width and depth from end to end and are usually designated shaft smoothers. A few have wide, shallow grooves of irregular depth, and one has a narrow shallow groove tapering to a point at either end. These tools may have been used in shaping such wooden objects as arrow foreshafts, spindles, or prayer sticks (Dorsey and Voth, 1902, p. 226).

Chipped Stone Tools Used for Cutting and Piercing

Simple sharpened flake tools such as knives, scrapers (figs. 54, 55) and saws were much more numerous than artifacts such as projectile points, blades and drills with secondary chipping on all their surfaces.

Although all the flake knives (fig. 56) have secondary chipping along one or more edges to sharpen them, a great many also have along these same edges some very minute chipping that probably resulted from use. The only material we recovered which may have been worked with these knives is bone. Some of the bones exhibit cutting marks which appear to have been made with this kind of flake knife.

Some of the worked sherds and stone pendants have biconical holes which appear to have been made with a stone drill. However, most of the small stone and shell beads have very small holes of uniform diameter that must have been made with a smaller object.

The majority of the projectile points (fig. 57) are small to medium in size (2.3 to 4.0 cm. long) and must have been used as arrow heads. The small triangular specimens are similar to mounted examples in various collections (Cosgrove, 1947, p. 63, figs. 76, 131; Hough, 1914, pp. 64–65).

Ornaments

The objects (figs. 58, 59) with which the people adorned themselves were bead necklaces, bracelets, and pendants. Although a fairly large

FIG. 44. Small metate-like grinding stones. Length of upper specimen, 29.7 cm.

FIG. 45. Painted slabs. Length of lower left specimen, 18.3 cm.

FIG. 46. Mortars and stone bowls. Diameter of lower right specimen, 11.1 cm.

FIG. 47. Large mortar. Length, 19.0 cm.

number of such objects was found, there was little direct evidence of their use. One burial at Mineral Creek Site had a necklace of black (jet) and white (shell) disc beads coiled several times around his neck, collar fashion. A series of eighteen or twenty black beads alternated with one or two white ones. A rectangular turquoise pendant was part of this necklace.

The use of shell bracelets (fig. 60) is known from their positions on the forearms of numerous burials throughout the Southwest (Cosgrove and Cosgrove, 1932, pp. 65–66; Haury, 1940, p. 117; Roberts, 1931, p. 130; Martin and Rinaldo, 1940, pp. 68, 88). Ordinarily they occur in multiple numbers on the lower left arm and it has been suggested that they served as bowguards. However, in some instances only one or two were worn and in other instances as many as ten on each arm, so this was probably not the primary purpose.

FIG. 48. Axes. Length of lower right specimen, 11.0 cm.

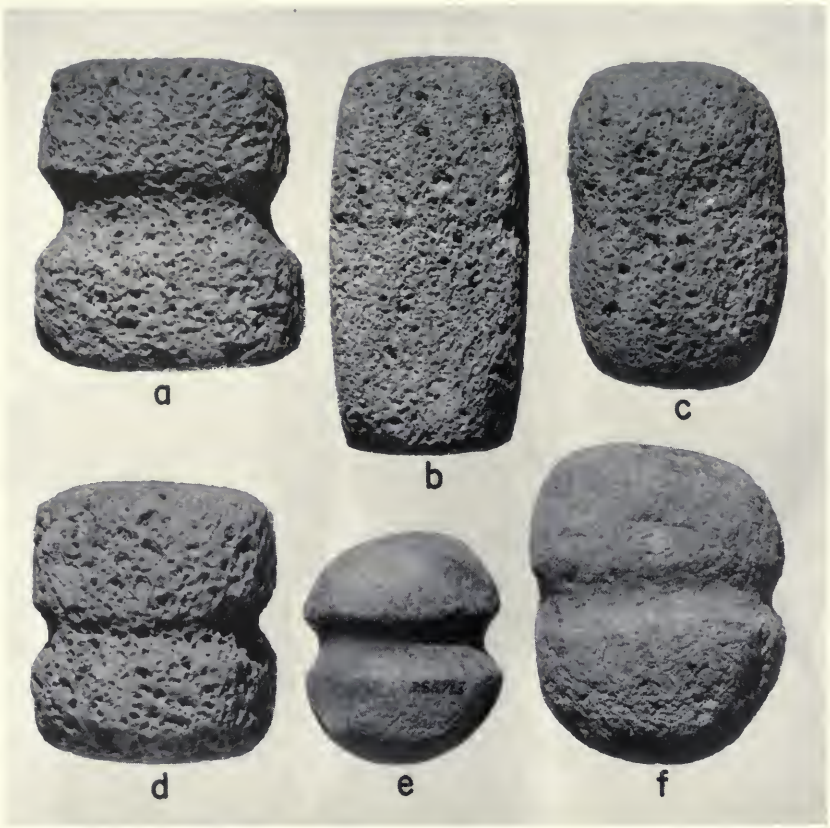

FIG. 49. Mauls. Length of lower right specimen, 11.7 cm.

Pendants are of several forms and materials. The only feature all of them have is that they are perforated—usually near one end for suspension. They are made of turquoise, shell and bone. Most of the turquoise and bone specimens approach a rectangular form. The shell objects are of whole shell (olivella, small bivalves, etc.), the rims or umbo of *Glycymeris*, and the thick beak portion of an unknown shell.

Some of these pendants were used as parts of necklaces (as found at Mineral Creek); others may have been sewn on clothing or bandoleers (although there is no archaeological evidence of this, the historic Pueblo Indians have used them in this way; Stephen, 1936, p. 751); or they may have been worn as ear bobs. A fourth possible use is a religious one. Although these objects were all found in trash others much like them

FIG. 50. Small choppers, biface type at bottom, uniface at top. Length of upper right specimen, 9.8 cm.

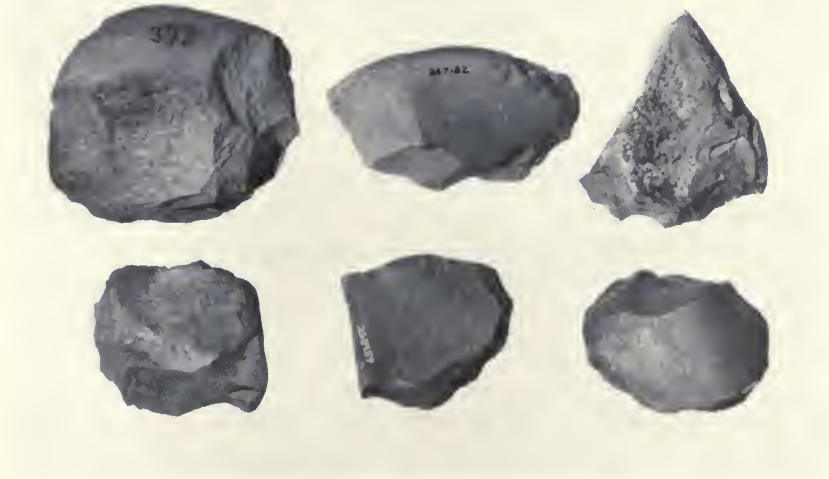

FIG. 51. Large choppers. Length of upper right specimen, 14.3 cm.

FIG. 52. Notched stone slab (left); length, 54.0 cm. Stone ring slab; length, 39.2 cm.

have been found in caches; for example, a pendant was found in the north niche, Kiva II, Table Rock Pueblo (Martin and Rinaldo, 1960b, p. 270).

The bone ring fragments (fig. 61) are of small diameter. These are probably finger rings as they are about that size, and they usually have been designated in this way. However, I know of no instance in the Southwest where they have been found in this position on a burial.

TOOLS USED FOR WEAVING

A large number of bone awls (fig. 62) was recovered. Moreover, the collection is unusually varied in material, in the degree of finish or workmanship, and in the shapes of the tips. Whereas the awls from the earlier sites were made from the bones of two or three species of animals and all from limb bones, these were made from the bones of several species and not merely from limb bones, but also from ribs and scapulae. Furthermore, they vary, through a fine series of gradations, from simple ulna awls which have been only ground down and sharpened, to delicate pin-like objects which have been entirely modified in forms shaped all over. Furthermore, the tips were shaped in an extraordinary number of ways—some shouldered, some round in cross-section, some flat on both sides, some with thin and fine points, others thick and almost blunt.

It seems clear from this amount of variation that the awls were used in a number of different ways, and the quantity found seems to suggest that weaving was important. They exhibit some marks of use. Some have shallow grooves across the tips—the kind of wear which would result from pressing them against the warp threads. Others are scratched in a close spiral as if they had been used to make holes in some hard material, and a few are blunted as if they had been used for flakers.

FIG. 53. Arrow-shaft abraders and grooved stones. Length of lower right specimen, 9.8 cm.

FIG. 54. Small scrapers. Length of lower right specimen, 4.6 cm.

Fig. 55. Large scrapers. Length of lower right specimen, 7.6 cm.

FIG. 56. Flake knives and blades. Length of lower right specimen, 5.2 cm.

FIG. 57. Projectile points, miscellaneous types. Length of lower right specimen, 1.9 cm.

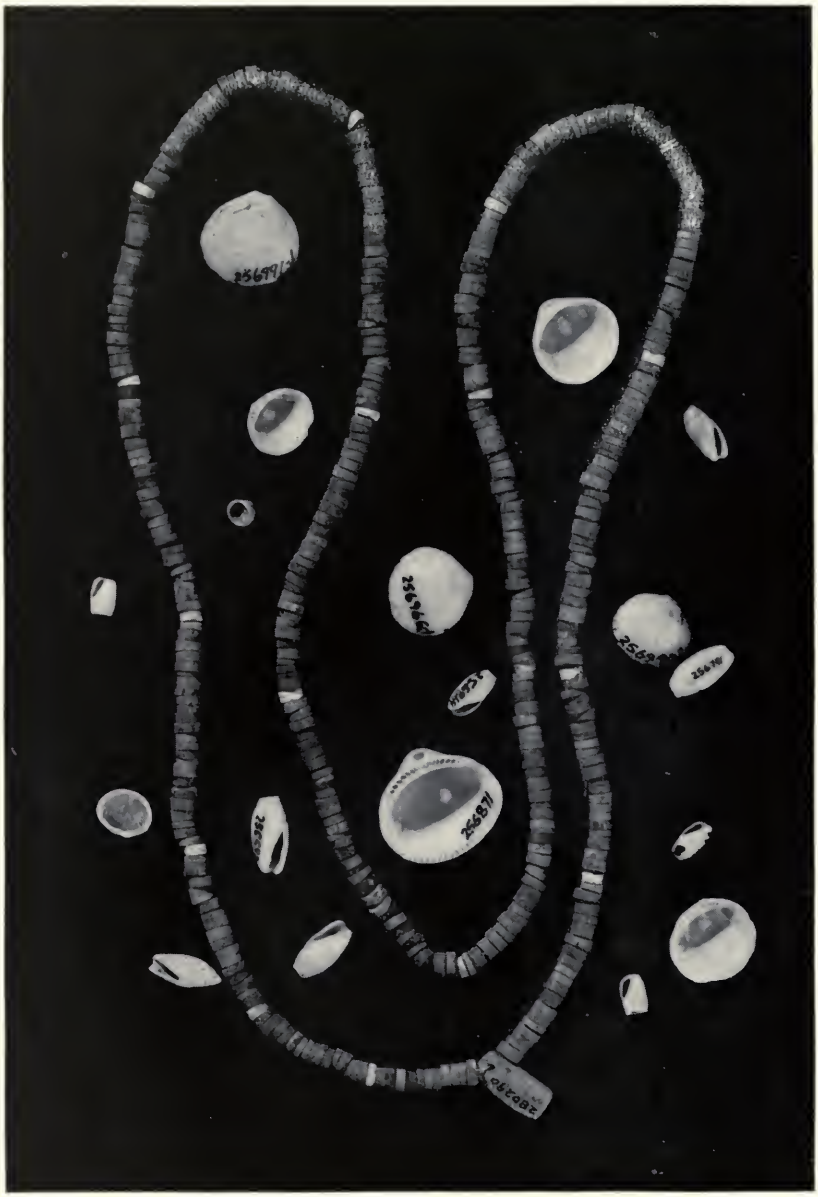

FIG. 58. Necklace (cat. no. 280290) with turquoise pendant, shell pendants and beads. Width of largest bivalve pendant, 2.6 cm.

FIG. 59. Stone ornaments, animal effigy, disc, and faceted hematite. Length of lower left specimen (effigy), 4.1 cm.

ARROW-MAKING TOOLS

In addition to the abrading stones that were used for making wooden foreshafts and the bone flakers just mentioned, antler tines (fig. 63) were used for flaking (projectile points), as is indicated by the bevels on their tips.

There were also two kinds of tools with which arrow mainshafts were worked—an antler wrench which might have also been used for straightening spindles for weaving, and several types of grooved arrow-shaft straighteners (fig. 64). There is very little direct archaeological evidence on these tools, but there is historic information.

MISCELLANEOUS OBJECTS

A number of bone tubes (fig. 65) were recovered. In general these are simple hollow shafts of long bones which have been ground smooth at both ends. They range in size from 2.5 cm. up to 13.6 cm. in length. The

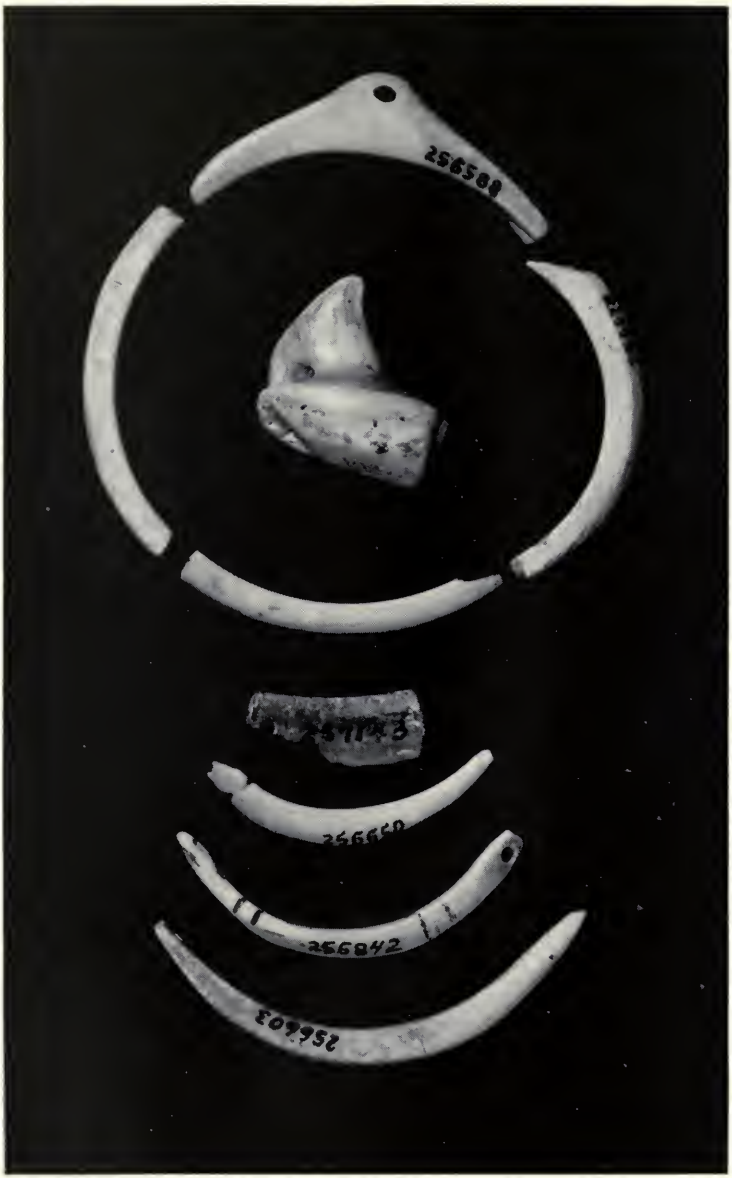

FIG. 60. Shell pendants and fragments of shell bracelet. Length of bottom specimen, 5.7 cm.

FIG. 61. Bone rings and ring material, and bone pendants. Diameter of lower right specimen, 2.6 cm.

FIG. 62. Bone awls, miscellaneous types. Length of lower right specimen, 17.5 cm.

Fig. 63. Flakers made of antler and bone, bone disc fragment and wrench made of antler. Length of bottom specimen (wrench), 19.7 cm.

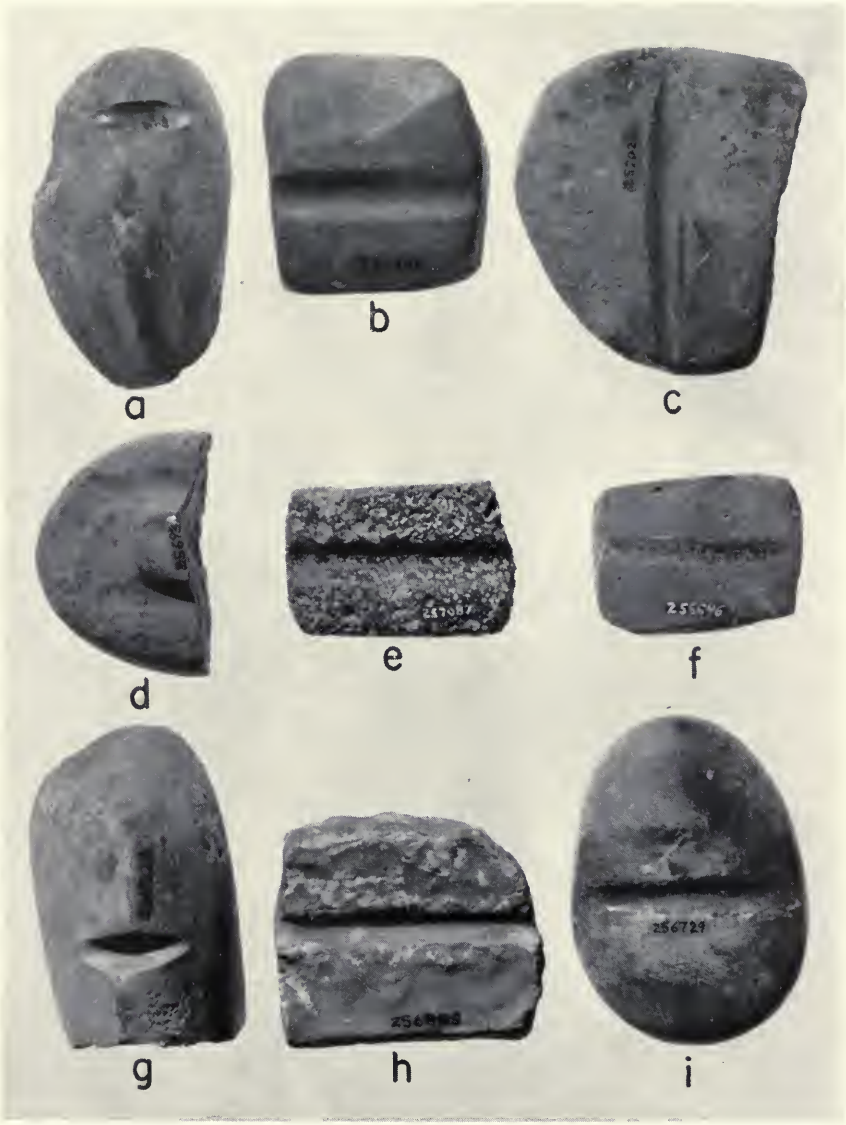

Fig. 64. Arrow-shaft straighteners. Length of lower right specimen, 10.0 cm.

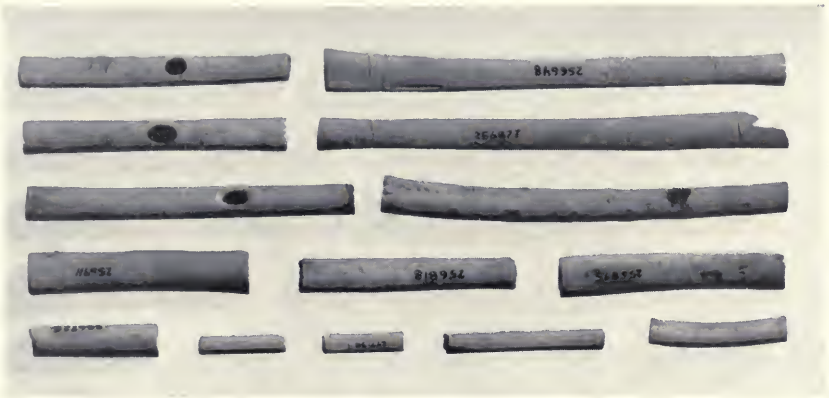

FIG. 65. Bone tubes and whistles. Length of lower left specimen, 3.7 cm.

shorter specimens could have been used as beads such as were found in a necklace on a burial at Sikyatki (Fewkes, 1904, p. 95); others of larger diameter may have been used as wrist-guards or bowguards such as were found on the wrists of burials at Hawikuh (Hodge, 1920, p. 134).

There are two specimens of about the same length (13.6 cm.) of the "ringed type," that is, having two circles incised around each end. These appear to have had some particular significance and use.

A set of bone tubes, each pierced with a single hole near the middle of the shaft, was found in Room 5B, and others like them in two other rooms. These have been designated as whistles and may have been used for bird calls as among the historic Pueblo Indians (Kidder, 1932, fig. 211).

One sun-baked clay jar plug (fig. 66) was found which bears the clear imprint of the rim of the jar. There is a vague impression of a corn cob within the circle formed by the rim. This object is roughly the shape of a mushroom.

A series of stone discs (fig. 67) was also found. They range in diameter from 12.6 cm. to 17.8 cm., and it has been suggested that they, too, served as jar covers (Morris, 1939, p. 131; Judd, 1954, p. 127).

All the small pebbles which have been classed as polishing stones (fig. 68) have one or more flat polished facets on their surfaces. These were probably used for polishing pottery. They are much like stones used by the historic Pueblo Indians.

INFERENCES OF USE FROM ASSOCIATIONS OF ARTIFACTS

The following evidence of uses for artifacts was partly substantiated by associations:

FIG. 66. Pottery pipe (left) and jar plug. Length of pipe, 14.5 cm.

(1) Axe-sharpening: Five out of six axe-sharpening stones (fig. 69) were found in rooms that also contained axes.

(2) Flint-chipping and arrow-making: Arrow-making tools such as arrow-shaft straighteners, wrenches, abraders, and flakers for chipping arrowheads were found primarily in rooms that also contained a large number of chipped stone artifacts such as projectile points, knives and scrapers.

(3) "Ceremonial" use together of medicine cylinders (fig. 70) and blocks with broad irregular grooves: A medicine cylinder was found directly with a grooved block.

FIG. 67. Pot covers. Length of upper right specimen, 13.3 cm.

COMPARISONS OF ARTIFACTS

The manos from the Hooper Ranch Pueblo were longer and thinner on the average than those from the Mineral Creek Site. There were also more one-hand manos from the lower habitation level (13 manos) at the Hooper Ranch Pueblo than from the upper habitation level (4 manos). Manos with beveled grinding surfaces (sometimes designated as two adjoining grinding surfaces) were more frequent also at the Hooper Ranch Pueblo (68 manos, 28 per cent of all manos) than at the Mineral Creek Site (7 manos, 23 per cent). These apparent trends in the Upper Little Colorado River area toward longer and thinner manos, fewer one-hand manos, and more manos with beveled grinding surfaces in late Pueblo III and early Pueblo IV than in late Pueblo II and early Pueblo III, seem consistent with trends noted elsewhere in the southwest (Woodbury, 1954, pp. 70–71, 80–81; Bartlett, 1933, pp. 18–19; Kidder, 1932, p. 71; Martin, Rinaldo, and Barter, 1957, pp. 40, 42).

There were relatively few manos with grinding surfaces which were more sharply convex from end to end than from side to side at the Mineral Creek Site (2 specimens) and none were recovered at the Hooper

FIG. 68. Polishing stones. Length of lower right specimen, 4.1 cm.

Ranch Pueblo. The infrequent occurrence of this type of mano is probably a concomitant of the equal scarcity of metates with deep troughs, with which they seem to be almost invariably associated.

There were few rubbing stones at any of the late sites in the Upper Little Colorado drainage. However, the most were recovered from the Mineral Creek Site (5 specimens); the numbers decreased in the Hooper Ranch Pueblo (3 specimens) and Table Rock Pueblo (2 specimens). This seems to suggest a decrease in the popularity of this type of artifact from early to late, as was noted in the Reserve area (Martin,

FIG. 69. Axe-sharpening stone. Length, 45.4 cm.

Rinaldo, Bluhm and Cutler, 1956, p. 58). In general, rubbing stones are of less frequent occurrence in the Upper Little Colorado drainage than in the Reserve area.

On the other hand, grinding stones of the shapes illustrated (fig. 37) seem to be characteristic artifacts in the late sites of this area, and polishing stones are quite common in the collection from the Hooper Ranch Pueblo. All except one of the grinding stones were from the lower habitation levels.

The flat metates, the trough type metates, and the two shallow basin metates are essentially similar to those from other late sites in the Western Pueblo area. The trough type metates from the Upper Little Colorado

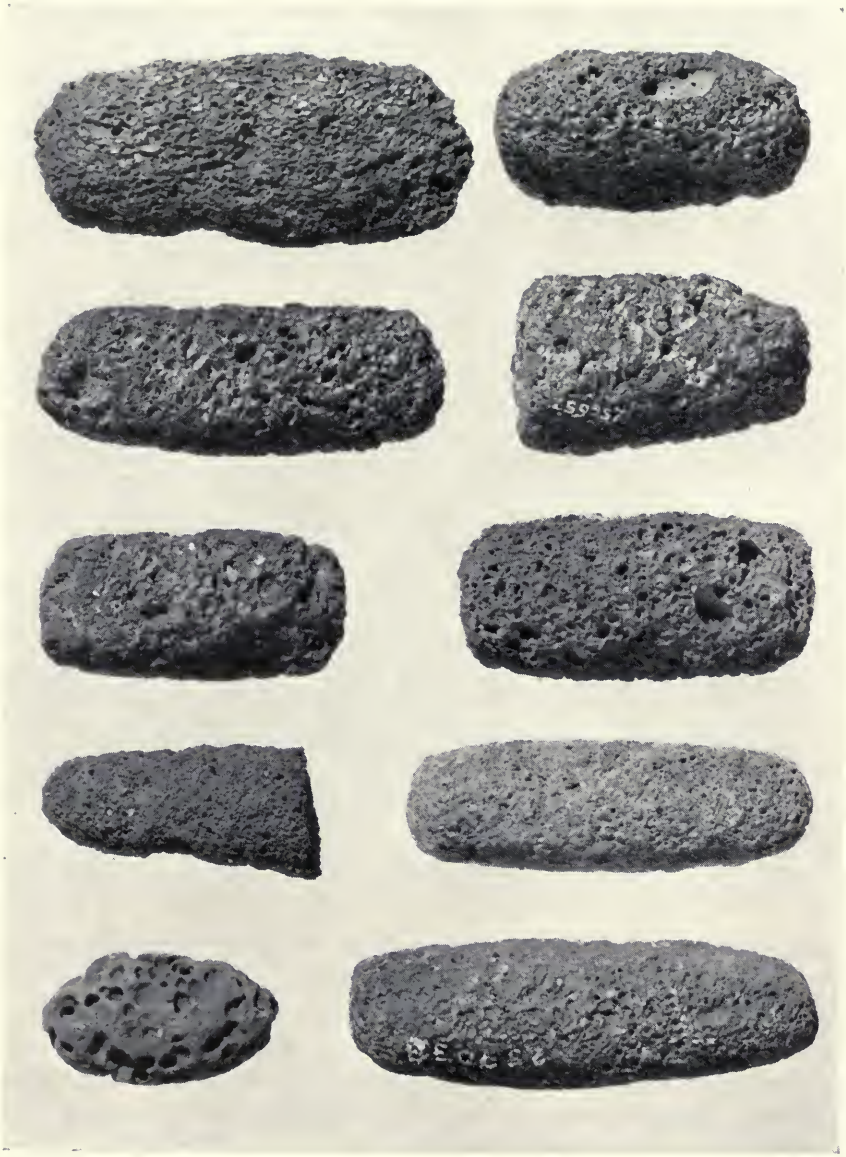

FIG. 70. Medicine cylinders. Length of lower right specimen, 9.9 cm.

River area have in general shallower troughs than some from Salado sites, for example, but this may be due to less use and consequently less wear rather than some cultural factor.

The occurrence of very few shallow basin metates at the Hooper Ranch Pueblo parallels the occurrence of similar objects in Awatovi (Woodbury, p. 113, fig. 23j), where they were designated as grinding slabs, and at Arizona W:10:51 (Wendorf, 1950, p. 54). Few of them occur, but their presence in late Pueblo III and in Pueblo IV brings up the problem of why they do not occur more often in Pueblo II and early Pueblo III sites, since they are found on Basket Maker and early Mogollon sites.

Small metate-like grinding stones, paint grinding slabs and some of the manos and mortars appear to have been used for grinding paints. A considerable number of lumps of pigments was recovered from the Hooper Ranch Pueblo, and there appears to have been some increase in the use of pigments at this site and Table Rock Pueblo over the amount used in the Mineral Creek Site.

Although fragments of painted slabs with definite designs on them were recovered at the Hooper Ranch Pueblo, these were too fragmentary to compare with painted slabs (or tiles) from such sites as Kawaika-a (Smith, 1952b, pp. 262–265), Sikyatki (Fewkes, 1898, pp. 612–613), Chevlon and Homolobi (Fewkes, 1904, pp. 104–106), Point of Pines (Di Peso, 1950, pp. 57–63), Four Mile, Pinedale, and Showlow (Fewkes, 1904, p. 162; Spier, 1918, p. 217; Haury and Hargrave, 1931, pp. 56–59), Kinishba (Cummings, 1940, p. 107), Higgins Flat Pueblo (Martin *et al.*, 1956, p. 74), and Swarts Ruin (Cosgrove, H. S. and C. B., 1932, pp. 53–54). Their presence at the Hooper Ranch Pueblo adds to the substantiation of the hypothesis that "the use of painted stone slabs appears to have been general in Pueblo III and Pueblo IV times at least in the west."

Several complete specimens and a great many fragments of worked stone slabs were recovered from Hooper Ranch Pueblo. Primarily these are of rectangular shape and possibly were used for doors or hatchway covers or for closing ventilator openings. One of these slabs had a notch in one side. Five others were fragments of ring slabs. In general, worked slabs are found throughout the Southwest wherever there are stone masonry pueblos. The ring slabs are a more specialized form and have a more limited distribution which apparently centers in the region of the White Mountains and the Upper Little Colorado River drainage.

Several small mortars and one large stone bowl were recovered from the Hooper Ranch Pueblo and half a dozen fragments from Mineral Creek Site. In general, there appears to be an increase in the use of mortars in the Upper Little Colorado River drainage from early to late,

and they appear to be more common in the west than they are in the Rio Grande area, for example (Woodbury, 1954, p. 119). Those that had been used for paint bear a resemblance to mortars from Awatovi (op. cit., fig. 24, *d–h*).

Most of the axes are either full-grooved or transitional to full groove; that is, the groove is present on the flat side of the axe but is much shallower than on the other three sides. Nevertheless, the existence of the flat side in the majority of these objects suggests that the J-type haft or a modification of it was the more prevalent mode of fastening a handle. Three of them have the short stubby type of cutting blade which Roberts (1932, p. 141) says is typical of axes from the Little Colorado River drainage. No axes were recovered from the Mineral Creek Site, but a number of large choppers recovered there may have been used instead of axes for wood chopping.

One full-grooved maul was found at the Mineral Creek Site, and both full and three-quarters grooved types at the Hooper Ranch Pueblo. Some of the full-grooved specimens at this site have only a very shallow groove on the flat side, like the axes, and one has only a very shallow encircling groove.

Full-grooved axes and mauls are more common than the three-quarters grooved types in the Hooper Ranch assemblages. It is sometimes difficult to distinguish the axes which have had their cutting edges broken off and have become blunted from the mauls, but in such instances those with rounded ends were designated mauls and those with more angular ends, axes. The mauls tend to be what Roberts (1932, p. 141) terms the tabular type (fig. 49, *a*), although two are more cylindrical. The three-quarters grooved types are in general more common toward the south and west.

Although mauls were discovered in a variety of forms the arrow-shaft tools were even more heterogeneous. The two larger categories of these tools are the arrow-shaft straighteners and arrow-shaft smoothers. The smoothers are grooved implements of abrasive stone, usually sandstone; the straighteners are implements with polished grooves and are made of close-grained stone, ordinarily limestone. The grooves on the smoothers run down the length of the specimen. Many of the grooves on the others are transverse. Two of the small blocks are triangular in cross section (fig. 64, *a*, *g*), and another fragment (fig. 64, *d*), is of the ridged type, with a distinct ridge which appears to have run parallel to the grooves in the middle of the specimen. The abrasive smoothers have a distribution from the Southwest into the Plains states (Toulouse, 1939, pp. 82, 85). Among the Mogollon they originated as early as the Circle Prairie Phase (Wheat, 1954, pp. 123–124). The straighteners are mostly of later date, especially

those with triangular cross section and the ridged type, both of which have been reported from sites dating in the thirteenth century or later.

The abrading stones were recovered only from the lower habitation level at the Hooper Ranch Pueblo. They are similar to abrading stones found at Higgins Flat Pueblo (Martin, *et al.*, 1956, pp. 93–94, fig. 51) and at Apache Creek Pueblo (Martin, *et al.*, 1957, p. 56, fig. 39, *i*). Less symmetrical shapes of abrading stones are found in many earlier Mogollon sites.

The pot rest stones found in the firepits seem to be a trait mostly of late Pueblo sites. These were recovered in the upper habitation level at the Hooper Ranch Pueblo but not in the lower habitation levels or at the Mineral Creek Site. Similar pot rest stones were recovered at Foote Canyon (Rinaldo, 1959, pp. 250–252) and at the Table Rock Pueblo (Martin and Rinaldo, 1960b, p. 256).

Small, rough, cylindrical stones of vesicular basalt or other volcanic stone are a type of object rather frequently found in excavations in the Little Colorado basin and west to the Flagstaff area (Bartlett, 1934, p. 26; McGregor, 1941, p. 178), south and west to Tuzigoot (Caywood and Spicer, 1935, p. 86), and north to the Jeddito area (Woodbury, 1954, pp. 181–182).

One small notched hoe (fig. 71) was recovered. It is polished only on one end very close to the edge. The general form of this implement is vaguely reminiscent of the fragments of hoes from the early Mogollon sites (Martin, 1943, p. 222, fig. 82; Wheat, 1954, p. 130), although the early hoes are not notched. The notches are set like those on a hoe from Three Pines Pueblo, also in Pine Lawn Valley (Martin and Rinaldo, 1950b, fig. 188, *a*). This implement is also like one illustrated by Pepper (1920, fig. 22) from Pueblo Bonito.

Many of the projectile points found at both Mineral Creek Site and the Hooper Ranch Pueblo are small triangular points notched from the sides at right angles to the long axis of the blade. The majority of these points have straight bases; one has a slightly concave base, and another a deeply indented base similar to those on certain points illustrated by Woodbury (1954, fig. 25, *a–g*). Those with a straight base are typical Pueblo points and have a distribution primarily from about A.D. 900 to 1350 or later, in both the Mogollon and Anasazi traditions. They have also been found on Upper Pima sites (Di Peso, 1956, pl. 130) and on Sinagua sites in the Flagstaff area (McGregor, 1941, fig. 64, *j*).

The other projectile points are less easily classified. There are, for example, a number of simple triangular points without stems or notches. Some of these have convex bases and others have concave or straight bases. Most of these appear to be a variant of the "typical Pueblo point,"

or possibly that type in the process of manufacture, and with the exception of a few of the leaf-shaped type, they have a similar distribution. The other larger category is that of medium-sized points with expanding stems which have been formed by corner-notching (most of these are lateral notched rather than diagonal notched). This group is less uniform in design, but there is some resemblance to points from the Pine Lawn Phase (Martin and Rinaldo, 1940, fig. 29, upper row), and it seems that they may be a late variation of this type.

The other projectile points are also of medium size. There is only one of each style.

The drills (fig. 72, *g–j*) are of two types, one plain shafted and the other tapering from a wide, thick base. Both of these types were used in the pre-ceramic cultures throughout the Southwest (Haury, 1950, pp. 301–303; Morris and Burgh, 1954, p. 57; Martin, *et al.*, 1952, p. 115), but from that time up to historic times were used apparently only to a more limited extent. At least, very few are reported from any but the largest sites.

Chipped saws (fig. 72, *a–f*) which may be a form of serrate flake knife or scraper have been recovered most often from the later sites in the Upper Gila drainage. However, in the Upper Little Colorado drainage they have been found on sites of all periods.

With a few exceptions the scrapers and flake knives were too heterogeneous in shape to fall into groups on this basis. Scrapers were separated from knives on the basis of thickness and manner of chipping (scrapers are more than 7 mm. thick and are chipped at a steeper angle than knives). Scrapers were separated into two groups, one of smaller specimens (mostly small, rough, thick), and one of larger specimens (large, rough, thick). There were many more of the large, rough, thick scrapers from Mineral Creek Site than from the Hooper Ranch Pueblo. One hollow-edge scraper came from Hooper Ranch Pueblo and one small serrate scraper from the Mineral Creek Site. Hollow-edge scrapers occur widely in the Mogollon culture but are not reported from the Hokoham or Anasazi culture. The serrate scraper has mostly an early distribution in the Cochise and Mogollon cultures.

More and larger choppers were found at the Mineral Creek Site than at the Hooper Ranch Pueblo and there are more biface choppers (on which the cutting edge is flaked from both surfaces) from the Mineral Creek Site. This may be correlated with the absence of axes at the Mineral Creek Site and their presence at the Hooper Ranch Pueblo. Uniface choppers exceed biface choppers at both sites. Although choppers occur in the Anasazi sites they are not as common as they are in the Mogollon, where they have a distribution from Cochise times up to A.D. 1350 and possibly later.

FIG. 71. Whetstone, smooth saw, miniature mauls, arrow-shaft tool, hoe, small discs and small bowl. Diameter of lower right specimen, 5.2 cm.

More ornaments and more types of ornaments were found at the Hooper Ranch Pueblo than at the Mineral Creek Site. This difference between the two sites is probably due to the fact that the former site is larger and was occupied later in time; generally more ornaments are recovered from late sites than from early ones. Only a few of the ornaments are those of types indicative of the age of the latter site. Most of the ornaments such as disc beads, olivella beads, bone tubular beads, thin shell bracelets and tabular stone and bone pendants are found in almost every area and culture of the Southwest and over a period of hundreds of years from Basket Maker and Pine Lawn Phase times up through Pueblo V.

The types which may be indicative of a late period of occupation for the Hooper Ranch Pueblo are a thick shell bracelet, whole bivalve shell pendants, bone rings and a carved bone zoomorphic pendant.

A number of simple bone whistles were found of the type that has a single perforation about midway between the ends. The distribution of this type of bone whistles is largely northern until quite late, when they occur at Kinishba (Baldwin, 1939b, p. 320), at Table Rock Pueblo (Martin and Rinaldo, 1960b) and at the Village of the Great Kivas (Roberts, 1932, p. 138, pl. 47, *i*).

Ninety-three bone awls and flakers were recovered from the Hooper Ranch Site. This is more than were recovered at Higgins Flat Pueblo (Martin, *et al.*, 1956, pp. 114–117), the Table Rock Site (Martin and Rinaldo, 1960b, p. 278), Arizona W:10:51 (Wendorf, 1950, pp. 77–79, 135), or Foote Canyon Pueblo (Rinaldo, 1959, pp. 264–267); the large number seems to indicate some sort of specialization along this line. They also include most if not all the recognized types listed by Kidder (1932, p. 202), and a variety of forms of tips; they were made from a fair number of animal species. This kind of specialization in bone awls and other bone tools appears to be more characteristic of the later sites in the Southwest. Very few awls were recovered at Mineral Creek Site.

One wrench and one wedge (or chisel) made of antler came from the rooms. The distribution of these implements, particularly in the Upper Gila and White Mountain region, is generally in sites of Pueblo III age or later. Wrenches were found at Canyon Creek (Haury, 1934, p. 126), Kinishba (Baldwin, 1939b, pp. 319–320), Arizona W:10:51 (Wendorf, 1950, p. 83), and Higgins Flat Pueblo (Martin, *et al.*, 1956, p. 120), and wedges have a similar distribution.

Two small animal effigies from the Hooper Ranch Pueblo are similar to effigies from farther south (Martin, *et al.*, 1954, p. 156; 1956, p. 121; Wendorf, 1950, p. 86; Nesbitt, 1938, p. 100; Hough, 1914, pp. 115–116). One of those from the Little Colorado site is made of sandstone, the other

FIG. 72. Saws (*a–f*), drills (*g–j*), punches (*k*, *m*) and graver (*l*). Length of lower right specimen, 5.3 cm.

of pottery. The pottery effigy has been broken, like most of those from the Reserve area. Although a few scattered specimens have been recovered from the earlier periods of the Mogollon culture (Haury, 1940, p. 117; Martin, *et al.*, 1952, p. 194), the majority are from later sites.

A large, painted pottery pipe was found on the floor of a small storage room (Room 10, the Hooper Ranch Pueblo). At the bowl end this pipe has a collar-like section smaller in diameter than the body proper (see fig. 66). The pipe is made of fine clay, and has quite thick walls. The exterior is slipped with a white ground which is decorated with a brown painted design. This design, somewhat obscured by fire clouds and the weathering of the slip, appears to consist of ordinary stripes running lengthwise and alternating with two stripes bordered by opposed interlocking pennant-figures which form a "negative" lightning design in the white ground between them. The lines with the pennant-figures terminate at the bowl end in a zigzag and an element shaped like a capital T, and faintly resemble the lightning slabs which form part of the main Powamu altar (Voth, 1901, pl. 38).

This pipe resembles others made of stone from the upper San Francisco River, two of which are painted with stripes running the length of the pipe (Hough, 1914, pp. 113–114, fig. 259; Martin, *et al.*, 1956, p. 96). In a more general sense, as a straight-bore pipe it resembles such pipes from Basket Maker and Pine Lawn Phase times up through Pueblo V throughout the northern part of the Southwest, but its general proportions, its length, the collar-like end of the bowl and the painted decoration tend to place it as late Mogollon Pueblo.

POSSIBLE FOREIGN ARTIFACTS

A few of the stone artifacts may be of foreign origin, for they are made of different materials from those found in the majority of the artifacts. These were a small mortar, a maul from the Hooper Ranch Pueblo, and a chopper from Mineral Creek Site. We have been unable to determine the source of the stone from which these were made.

The shell ornaments were also made from shells foreign to the area. Most of these have their source on the Gulf of California. Many were made from *Glycymeris* shells native to that area.

SUMMARY

There is a remarkable similarity between the artifacts from the Hooper Ranch and Mineral Creek sites considering the intervals of space and time that separate them. The majority of the artifact categories such as manos,

metates, arrow-shaft tools, medicine cylinders, and chipped saws, are the same; even many of the identical types of artifacts such as beveled manos, trough metates, small triangular projectile points and biface choppers were used. They can easily be grouped together as manifestations of one culture.

There are a number of differences, most of which would place the Hooper Ranch site as having been occupied later. The axe-sharpening stones, pot rests, smooth saws, antler wrenches, and the particular type of pipe would seem to indicate that the occupation was later. Additional evidence of the relative position in time of the two sites seems to be indicated by the greater frequency of shell ornaments and beveled manos at the Hooper Ranch Pueblo, the prevalence of choppers and the absence of axes at the Mineral Creek Site, and the relative abundance of axes and the scarcity of choppers at the Hooper Ranch Pueblo.

The kinds of techniques used in shaping the artifacts were much the same at both sites, but the technique of polishing was used more often at the Hooper Ranch Pueblo and that of flint chipping at the Mineral Creek Site. Furthermore, the artifacts from both sites are more neatly finished than those from Site 30 and earlier sites in the area, but they are not as carefully shaped as those from Table Rock Pueblo.

The marks of use found on the artifacts, the pigments or other materials remaining on their surfaces, their positions *in situ*, and their associations with other artifacts within each room or kiva mostly confirmed general knowledge as to their uses, such as the use of mortars for grinding pigments. However, the use of certain grooved slabs for sharpening axe-blades, and the use of certain antler tools and small grooved stone tools (antler flakers, wrench, arrow-shaft tools) in flint chipping, arrow-making and general hunting activities appeared to be corroborated by their consistent association in certain rooms and not in others.

A number of traits seem to indicate that the culture of the Hooper Ranch Pueblo was late Mogollon Pueblo, or, as it is frequently called, prehistoric Western Pueblo. Some of these traits are three-quarters grooved axes, polychrome pottery, brown corrugated pottery, pottery with smudged interiors, and rectangular kivas. In addition to these, we may also cite animal effigies, straight bore pipes, painted slabs and painted stone bowls.

In the stone and shell artifacts there is a hint that the upper habitation level was abandoned later than the lower one, but it is impossible to estimate the length of this interval without more exact dates from a series of local sites. Certain traits such as small, rough, stone cylinders, rubbing stones and chipped stone saws, which appear to be more frequent in

earlier sites, are more frequent in the early habitation level, and flat metates, grooved axes, and shell ornaments such as thick shell bracelets, which generally increase in popularity during Pueblo IV, were more abundant on the upper habitation level. The indications are not clear because of the less distinctive character of these objects, in contrast with pottery, for example, and the majority of the artifacts show continuity of use between the two levels.

Nevertheless, a gradual elaboration of the stone, bone, and shell artifacts is apparent, probably from a base much like that of the Concho culture.

OCCURRENCE OF ARTIFACTS AT HOOPER RANCH PUEBLO AND MINERAL CREEK SITE[1]

	Hooper Ranch	Mineral Creek
Manos		
Single grinding surfaces	54	20
Two grinding surfaces	37	4
Beveled	48	7
Small fragments	68	0
Rubbing stones	3	5
Grinding stones	12	3
Polishing stones	27	6
Pestles	6	1
Metates		
Flat	19	0
Trough	16	4
Basin	2	0
Metate-like grinding stones	9	0
Paint palettes	5	1
Painted slabs	11	0
Worked slabs		
Rectangular	70	3
Circular	2	0
Ring	5	0
Stone bowls	9	2
Stone mortars	14	6
Hammerstones	60	9
Projectile points	47	31
Drills	7	1
Gravers	1	2
Punch	1	2
Chipped saws	17	0
Flake knives	112	29
Scrapers	82	36
Choppers	17	24
Bracelets	6	0

[1] For tabulation by rooms, levels, and trenches see Martin, Rinaldo, and Longacre (1960).

OCCURRENCE OF ARTIFACTS AT HOOPER RANCH PUEBLO AND MINERAL CREEK SITE (*Continued*)

	Hooper Ranch	Mineral Creek
Pendants		
Glycymeris section	5	0
Whole shell	8	0
Clam	1	0
Triangular	1	0
Beads		
Disc	4	8
Olivella	9	0
Bone tubes	13	0
Whistles	9	0
Bone rings	4	1
Bone ring blanks	6	1
Bone awls	98	4
Rib tools	2	0
Curved bone object	1	0
Antler flakers	5	0
Axes		
Three-quarters grooved	5	0
Full-grooved	3	0
Fragments	3	0
Mauls		
Three-quarters grooved	2	0
Full-grooved	5	1
Arrow-shaft tools		
Longitudinal groove	3	0
Transverse groove	6	1
Truncate triangular	2	0
Ridged	1	0
Coarse-grained	4	0
Abrading stones	6	0
Whetstones	3	0
Axe-sharpening stones	6	0
Grooved stones	3	0
Stone discs	9	1
Pot rests	7	0
Medicine cylinders	14	1
Pipe molds	2	0
Smooth saws	2	0
Hoe	1	0
Stone pendant	1	1
Chisel	1	0
Wrench	1	0
Pipe	1	0
Animal effigy	1	0
Worked sherds		
Perforated disc	2	3
Plain disc	10	5
Fragments	6	14
Total	1043	238

IV. Pottery from Mineral Creek Site and Hooper Ranch Pueblo

GENERAL REMARKS

Parts of two sites were excavated in 1959: (1) The Great Kiva and some trenches at the Mineral Creek Site; and (2) twenty-five rooms and two kivas at the Hooper Ranch Pueblo.

In excavating, no grid system was employed, since the rooms and kivas themselves served as permanent and appropriate points of reference. The rooms and kivas were generally excavated in two units, "floor" and "fill." Artifacts labeled "floor" are those that lay directly on the floor and in the first 10 centimeters of fill above the floor. Materials coming from "fill" were those that were found in the dirt that was removed from the surface to within 10 centimeters of the floor. On subsequent inspection of the materials, the sherds in particular, it was found that the sherd sample from the floor was so small or so nearly like the sherd count from the fill above it as to be insignificant. Often the two samples were combined.

In a few instances at the Hooper Ranch Pueblo, where refuse appeared to be deep enough to warrant a "strati-test," a complete column of fill, that is, from surface to floor, was left standing and later removed in natural levels. No significant results came from these tests.

The sherds were washed, classified and counted in camp. We used the classification as worked out at Gila Pueblo and the Museum of Northern Arizona and revised by recent conferences held at Flagstaff (unpublished MSS. filed in Museum of Northern Arizona, Flagstaff, Arizona).

The pottery conforms to published descriptions of types established for the Vernon and neighboring areas. These descriptions will not be repeated; but at the end of the chapter I have included an alphabetical listing of the numerically frequent pottery types that we encountered and appropriate citations.

Complete sherd counts for all rooms and levels have been published (Martin, Rinaldo, and Longacre, 1960). A table showing total sherd tabulations and percentages for both sites is presented at the end of this chapter.

All the pottery discussed in this chapter appears to have been made by the coil-scrape method.

POTTERY FROM MINERAL CREEK SITE

Mineral Creek Site was excavated during parts of two seasons. The dwelling rooms were dug in the fall of 1958, after we had finished the Table Rock Pueblo (Martin and Rinaldo, 1960b). The Great Kiva and some trenches were dug during the first few weeks of the 1959 season.

FIG. 73. Reserve Black-on-White duck effigy; Mineral Creek Site (cat. no. 280307).

Pottery from this site was not abundant. Only three whole vessels were recovered:

Duck effigy (fig. 73): Reserve Black-on-White (cat. no. 280307); we call this Reserve Black-on-White, although the longitudinal stripes near the rim are reminiscent of Roosevelt Black-on-White; it was found with the skeleton of a young child under the floor of Room 1. With it was a necklace made up of approximately 2,000 beads of stone and shell plus a small turquoise pendant.

Seed-jar (fig. 74): San Francisco Red (cat. no. 256427); it was found with the skeleton of an adult in the fill of the Great Kiva.

Bowl (fig. 75): Wingate Black-on-Red(?) (cat. no. 256428), with unslipped bottom on exterior (cream color) similar to Houck Polychrome; with it was found the burial listed above in the fill of the Great Kiva.

FIG. 74. San Francisco Red seed-jar (cat. no. 256427). Found with Burial 1, Mineral Creek Site.

FIG. 75. Wingate Black-on-Red(?) bowl (cat. no. 256428). Found with Burial 1, Mineral Creek Site.

These last two vessels were nested together, the seed-jar inside the bowl. The jar contained a projectile point and some flint chips.

In addition, approximately 6,000 sherds were recovered from fill and floors of rooms and the Great Kiva and from exploratory trenches. A table listing total pottery types, numbers of sherds and percentages for the entire pueblo (fill, floors, and trenches combined) is given herewith (pp. 145–146).

Analysis of the frequencies of pottery types (figs. 76–78) indicates that the most popular decorated types were Snowflake Black-on-White (5.31 per cent), Reserve Black-on-White (2.89 per cent) and Tularosa Black-on-White (1.83 per cent).

The most abundant culinary types were brown indented corrugated (20 per cent) (similar to Reserve Indented Corrugated) and Alma Plain, Forestdale variety (18 per cent). We feel certain that what we call Alma Plain is not merely the lower, untextured portions of neck banded or neck corrugated wares because we found many rims and necks of Alma Plain ware. A glance at the sherd counts also will show that Alma Scored and Alma Neck Banded are relatively scarce. It is interesting to note that San Francisco Red is also rare.

An examination of the sherd counts shows that more painted pottery came from the Great Kiva than from the dwelling rooms and that the totals of culinary wares (plain and textured types) were approximately the same for the Kiva as for the dwelling rooms.

One thinks of dwelling rooms as the place for carrying on all the tasks concerned with daily life and the Great Kiva as the place for performing ceremonies. This kind of speculation then led us to assume that we would find relatively more painted and cooking pottery types in the dwelling rooms, but in this we were mistaken. Either our basic premise is incorrect or the sherds were deposited in some unusual manner, the meaning of which is not clear to us. It is possible that refuse was dumped into the Great Kiva; if this were so, we might have an explanation for the apparent discrepancies—more painted potsherds in the Kiva than in the dwelling rooms and approximately equal amounts of culinary wares in the Great Kiva and in the dwelling rooms. The difficulty with this hypothesis is that the fill in the Great Kiva did not appear to be refuse, but was merely plain, very hard dirt.

An alternate explanation is that since the Great Kiva was in effect a large basin the floor of which was lower than those of the dwelling rooms, dirt and sherds from the surface of the village and from the abandoned dwelling rooms tended to wash into the Great Kiva, thus causing a deviation from the expected sherd frequencies.

FIG. 76. Sherds from Mineral Creek Site; Snowflake Black-on-White.

FIG. 77. Sherds from Mineral Creek Site; Reserve Black-on-White.

FIG. 78. Sherds from Mineral Creek Site; Tularosa Black-on-White.

Vessel Shapes of Pottery from Mineral Creek Site

(Based mostly on evidence from sherds)

Decorated Types

Reserve Black-on-White; bowls and pitchers.
Snowflake Black-on-White; bowls.
Tularosa Black-on-White; jars.
Wingate Black-on-Red; bowls.

Textured Types

Brown plain corrugated, brown indented corrugated, gray plain corrugated, gray indented corrugated, patterned corrugated and Three Circle Neck Corrugated; jars mostly; an occasional bowl.

Brown plain corrugated, smudged interior; brown indented corrugated, smudged interior; McDonald Patterned Corrugated, smudged interior; bowls.

Plain Types

Alma Plain; jars and bowls.
Forestdale Smudged; bowls.
San Francisco Red; bowls and jars.
San Francisco Red, smudged interior; bowl.
Woodruff Smudged; bowl.

Technological Analysis of Pottery from Mineral Creek Site

Thin sections of seventeen sherds from Mineral Creek Site were prepared by Mr. Howard Anderson. The following types were included in this lot: Alma Plain (2); brown indented corrugated (2); McDonald Patterned Corrugated (1); Reserve Black-on-White (5); San Francisco Red (1); and Snowflake Black-on-White (6).

Mr. Bertram Woodland, Associate Curator of Petrology, of the Department of Geology of this Museum, has made a preliminary examination of these sections.

Briefly, the Snowflake and Reserve Black-on-White sections are similar and may be grouped together. Both types contain moderate amounts of sherd temper and abundant amounts of quartz and some feldspar inclusions.

The Alma Plain and textured types fall roughly into another grouping and are similar in that these wares do not contain any sherd temper but do have abundant amounts of quartz and feldspar inclusions with sparse

amounts of volcanic mineral aggregates. It is possible that these types were fired at a lower firing temperature than were the Snowflake and Reserve types.

The San Francisco Red specimen is slipped. It stands somewhat apart from and is apparently different from the brown plain and textured wares. Sherd temper is sparse, quartz particles are abundant, and other inclusions (mineral grain and mineral aggregates) are rare or absent. These specifications apply also to Snowflake and Reserve Black-on-Whites, although Reserve Black-on-White has relatively more sherd temper. As will be pointed out later in this chapter San Francisco Red also resembles Pinedale Polychrome to a considerable degree.

A word concerning sherd temper in Alma Plain pottery should be interjected here.

Last year, when we were preparing the report on Table Rock Pueblo (Martin and Rinaldo, 1960b), we made thin sections of Alma Plain pottery from the Reserve area (Pine Lawn, Reserve, and Tularosa phases), of some collected during Rinaldo's survey of the Vernon area (unpublished MSS), and of some from sites 30 and 31, near Vernon (Martin and Rinaldo, 1960a).

Petrographic examination of thin sections of Alma Plain from sites in the Vernon area that would date at about A.D. 900–1100 demonstrated that sherd temper was present in the few sherds we inspected.

From this slim evidence, we tended to assume that all Alma Plain that was made after A.D. 1000 in the Vernon area would be sherd tempered; but we have found that this is not true. Apparently some was sherd tempered and some was not.

Native versus Trade Types

It is customary for archaeologists in the Southwest to divide pottery from a site into two categories: native (local) and trade types. Frequently this dichotomy is based mostly on visual examination with a hand lens, on inspection of style of design and color, and on intuition. Sometimes, as in the classic example of the pottery from Pecos (Kidder and Shepard, 1936), an extensive laboratory analysis is used as a basis for making inferences concerning the origin of pottery.

Only 17 sherds out of a total of 6,884 have been ground for thin sections. Mr. Woodland, the petrologist, has reported on paste and temper, but in the absence of comparative materials he was unable to decide whether the clay deposits and materials used for tempering were all locally derived or in some cases were imported, or whether the pottery itself was locally made or imported.

In this connection, Mr. Woodland found that the plain and textured wares lacked sherd temper but were tempered probably with a local natural sand which itself was derived from the weathering products of a mainly granitic terrain. This suggests that the culinary wares were locally made—a reasonable and natural assumption.

In the sherd-tempered ware, the source of the mineral grains and mineral aggregate particles is not known. Quartz, in general, was the most common mineral grain. It is possible that these grains and aggregates are themselves derived from the pulverized sherds that were used as grog, although some of the finer materials may have been introduced in the clay itself.

Since we have no petrological or other data on which to base an opinion we are reluctant to divide the pottery from this site into native and trade types.

The limited number of sherds from Mineral Creek Site classified as Kiatuthlanna, Puerco, Red Mesa, and White Mound Black-on-Whites, and as Three Circle Red-on-White suggests the possibility of trade, but may equally well suggest other assumptions.

Significance of Pottery Types from Mineral Creek Site

The surveys that we have conducted in the Vernon area (see chapter V) indicate that Reserve Black-on-White is the dominant decorated pottery for the Little Colorado River Valley from about A.D. 1000. As one moves westward about 60 miles to an area near Snowflake, Arizona, one finds that Snowflake Black-on-White increases in frequency and that Reserve Black-on-White decreases proportionately.

The Mineral Creek Site bears out the findings of our reconnaissance in that the frequency of Snowflake Black-on-White is nearly double that of Reserve Black-on-White (5.31 per cent versus 2.89 per cent).

The presence of a small amount of Tularosa Black-on-White indicates that this type was in existence in the area and perhaps was replacing Reserve Black-on-White.

Two sherds—one St. Johns Polychrome and one Querino Polychrome —are not considered statistically or culturally significant.

The earlier types (Kiatuthlanna, Puerco, White Mound Black-on-White, and Three Circle Red-on-White) are likewise not considered to be significant since they represent an earlier time horizon. It is possible, though highly improbable, that they betoken an earlier occupation level. We conjecture that they were picked up by the inhabitants of the site as

they wandered about the country and were brought back to the pueblo as curiosa or as suitable material for making grog.

The important pottery types—Snowflake and Reserve Black-on-White, plus a sprinkling of Tularosa Black-on-White and the presence of indented corrugated (similar to Reserve Indented Corrugated) and McDonald Corrugated—suggests a tentative date for the pueblo of roughly A.D. 1000–1200. The distribution of the pottery throughout the rooms and the Great Kiva suggests that the living quarters and the Great Kiva were built at the same time. On the basis of architectural details (absence of masonry and the "primitive" or simple character of other features) one might guess that the Great Kiva antedates the masonry-walled surface rooms; but we have no direct proof that this is so.

The origin of Snowflake Black-on-White is unknown. Just as we can see affiliations between the designs of Reserve Black-on-White and those of Chaco wares, we think we can sense ties between Snowflake and Red Mesa, Holbrook or Walnut Black-on-White types. We cannot go beyond this simple guess at this time, but we hope some time to be able to throw more light on this subject and perhaps to place Snowflake Black-on-White chronologically.

POTTERY FROM HOOPER RANCH PUEBLO

The remarks concerning pottery from Hooper Ranch Pueblo are based on 13,422 sherds and 16 restorable vessels.

The restorable vessels fall into the following categories (alphabetically arranged):

Four Mile Polychrome bowl (figs. 79, 80; cat. no. 257150); found in fill of Room 4A; three masked(?) figures on interior; may represent kachinas; parts of vessel found in fill of Rooms 2A and 4A.

Four Mile Polychrome(?) bowl (fig. 81; cat. no. 257151); found in fill of Room 5A. Faint white designs on exterior.

Pinedale Polychrome bowl (fig. 82; cat. no. 257146); similar to Heshota-uthla Polychrome; found in fill of Room 5A.

Pinedale Polychrome bowl (cat. no. 257158); found in fill of Room 6B.

Pinedale Black-on-Red bowl (cat. no. 257159); found in fill of Room 2.

St. Johns Polychrome bowl (cat. no. 257160); found in firepit of Room 5B.

St. Johns Polychrome bowl (fig. 83; cat. no. 257152); found in fill of Room 9A.

St. Johns Polychrome bowl (cat. no. 257154); found in fill of Room 5A.

Fig. 79. Four Mile Polychrome bowl (cat. no. 257150); Hooper Ranch Pueblo. Restoration by Walter Boyer.

Fig. 80. Drawing of interior of kachina bowl, Four Mile Polychrome; Hooper Ranch Pueblo. Drawing by Gustaf Dalstrom.

FIG. 81. Four Mile Polychrome(?) bowl (cat. no. 257151); Hooper Ranch Pueblo.

FIG. 82. Pinedale Polychrome bowl (cat. no. 257146); Hooper Ranch Pueblo.

FIG. 83. St. Johns Polychrome bowl (cat. no. 257152); Hooper Ranch Pueblo.

FIG. 84. Tularosa Black-on-White canteen (cat. no. 257147); Hooper Ranch Pueblo.

FIG. 85. Tularosa Black-on-White pitcher (cat. no. 257148); Hooper Ranch Pueblo.

FIG. 86. St. Johns Black-on-Red bowl (cat. no. 257153); Hooper Ranch Pueblo.

FIG. 87. Woodruff Smudged bowl (cat. no. 257149); Hooper Ranch Pueblo.

FIG. 88. Pinnawa Glaze-on-White bowl (cat. no. 257161); found by Mr. Ernest Becker north of Springerville, Arizona.

St. Johns Polychrome bowl (cat. no. 257156); found in firepit, Room 5B.

Tularosa Black-on-White canteen (fig. 84; cat. no. 257147); found in fill of Room 6B.

Tularosa Black-on-White pitcher (fig. 85; cat. no. 257148); plain handle.

Tularosa Black-on-White jar (cat. no. 257155); found on Floor 2 and in fill of Room 4A.

Tularosa Black-on-White jar (cat. no. 257157); found near east wall, in fill, Room 5A.

St. Johns Black-on-Red bowl (fig. 86; cat. no. 257153); found in fill of Room 4A.

Woodruff Smudged bowl (fig. 87; cat. no. 257149); found at Hooper Ranch.

Pinnawa Glaze-on-White bowl (fig. 88; cat. no. 257161); found by Mr. Ernest Becker north of Springerville, Arizona.

Vessel Shapes of Pottery from Hooper Ranch Pueblo

The shapes of the principal pottery types are listed below. The evidence for these listings was obtained from sherds and from the sixteen whole vessels that were recovered.

Bowls: Heshota-uthla Polychrome; Kwakina Polychrome; Pinedale Black-on-Red; Pinedale Polychrome; Puerco Black-on-Red; Querino Polychrome; St. Johns Polychrome; and Wingate Black-on-Red.

Bowls and Jars: Four Mile Polychrome and Reserve Black-on-White.

Jars: Tularosa Black-on-White.

The jar-shape was the most common form in the unpainted types. Bowl-shapes did occur in brown indented corrugated smudged, McDonald Corrugated, Tularosa Fillet Rim, San Francisco Red Smudged Interior, and Woodruff Smudged.

Technological Analysis of Pottery from Hooper Ranch Pueblo

Thin sections of 26 sherds from the Hooper Ranch Pueblo were prepared by Mr. Howard Anderson. The following samples, with the number of prepared sections in parentheses, are included:

Brown indented corrugated (1)
Clay sample no. 1 (potter's clay) (2)
Clay sample no. 2 (5) (unfired bowl)
Heshota-uthla Polychrome (2)
Kana-a Gray (1)
Kwakina Polychrome (3)
Pinedale Polychrome (3)
Gray plain corrugated (1)
Brown plain corrugated (1)
St. Johns Polychrome (2)
Tularosa Black-on-White (5)

Mr. Bertram Woodland, Associate Curator of Petrology, of the Department of Geology of this Museum, has made a preliminary petrographic analysis of these thin sections. We are very grateful to Mr. Woodland for the generous amount of time that he gave to our project.

Mr. Woodland did not have comparative materials at hand and thus was unable to study the differences between local and trade pottery; therefore we cannot make statements about the categories. As a result of Mr. Woodland's careful study, these data were derived from the study of paste and inclusions:

All of the painted, decorated pottery was sherd tempered. The culinary ware contained no sherd temper.

Tularosa Black-on-White, Kwakina Polychrome and the potter's clay (sample no. 1) are strongly similar, but the potter's clay does show somewhat greater proportions of feldspar and volcanic particles as minor constituents when compared to the Tularosa or Kwakina samples.

St. Johns Polychrome and the unfired pottery bowl (clay sample no. 2) are almost identical.

Heshota-uthla Polychrome and Kana-a Gray have many characteristics in common although the latter has relatively few more mineral grains than the former.

Pinedale Polychrome to a considerable degree is like three types found at Mineral Creek Site: San Francisco Red, Snowflake Black-on-White, and Reserve Black-on-White.

The indented corrugated pottery from the Hooper Ranch Pueblo is similar to several types found at the Mineral Creek Site (Alma Plain, brown plain corrugated, and McDonald Corrugated); but the inclusions of volcanic material in the Alma Plain pottery relate it more closely to the brown plain and McDonald Corrugated than to the indented corrugated types. Thus, a relationship between the indented corrugated from the Hooper Ranch Pueblo and the plain and textured wares from Mineral Creek is observed, but it is thought to be one that is not very close.

On the basis of this slim evidence we conjecture that perhaps Heshota-uthla Polychrome, Kana-a Gray, and Pinedale Polychrome constituted trade pieces at Hooper Ranch Pueblo.

Reference has been made to clay samples no. 1 and no. 2. Clay sample no. 1 was a ball of gray clay that was found in Room 5A. Dr. Rinaldo thought it might be a bit of potter's clay that had been prepared for use, set aside to "ripen" (as is done by contemporary Indians) and forgotten. He therefore saved this sample. Clay sample no. 2 is a bit of an unfired pottery bowl, yellow in appearance, found on the floor of Room 1B.

Whether a painted design had been added to this specimen is difficult to say. When small pieces of it were fired in an oxidizing atmosphere to a temperature of 600°, 700°, 800°, 900°, and 950° C. the paste turned red and the interior and exterior slips became readily visible as a good St. Johns Polychrome red. More of the origin of the slip material and color will be discussed later.

The recovery of a lump of potter's clay and an unfired pottery bowl in an open site is a rare event. We were eager, therefore, to make the most of this opportunity. An analysis of both of these samples was undertaken by Dr. Albert W. Forslev, Associate Curator of Mineralogy at this Museum. We are grateful for the time that he devoted to our project.

We herewith present a few of the facts that particularly interested us:

The clays from both samples—from the lump of potter's clay and from the unfired pottery bowl—came from the same deposit, although they may have been taken from different places in the deposit. The analysis further indicates some of the steps in pottery-making of the fourteenth century and these may have been similar to those in vogue among contemporary Southwestern Indians. Apparently, the procedure was to gather suitable clay, grind it on a metate to reduce the size of large particles, and then remove the coarser particles and organic elements by winnowing or by soaking the clay in water. This last step—soaking the clay—produced a soupy mixture on top of which organic elements floated while coarse heavy fragments sank to the bottom. The floating elements were then removed, and after the "soup" had been agitated, the silt and clay in suspension were decanted into another container.

After the clay was sifted and cleaned to the satisfaction of the potter, about 30 per cent (by weight) of crushed sherds were added to the clay plus some water (to make plastic) and the mass was well kneaded. Then it may have been set aside to "ripen" and in this case was forgotten.

Dr. Forslev found that the proportion of mineral grains was different in each sample. He concluded, nonetheless, that the mineral grains were natural constituents and that the different ratio of minerals in each sample may be due to the winnowing or soaking operations described above. The sherd particles were intentionally added as grog.

In addition to the analysis of the clay samples, Dr. Forslev tested some raw substance that we called limonite and that we thought might have been used for painting pottery. The analysis showed that the material was a mixture of kaolin clay and iron oxides. Dr. Forslev ground some to a powder, mixed it with water, smeared it on a glass slide and then fired it to a temperature of 600° C. Firing caused the sample to turn a red identical to the red found in the background of St. Johns Polychrome

pottery. It may be recalled that Mr. Woodland's petrographic analysis suggested that the pastes and inclusions of the unfired bowl and that of St. Johns Polychrome were almost identical. This suggested relationship plus the discovery of the iron oxide paint that burns red almost definitely establishes the fact that the unfired pottery bowl was destined to have been St. Johns Polychrome.

The following comments were written by Mr. Bertram Woodland:

"It is of interest to draw attention to the similarities and distinctive features of Tularosa, St. Johns, the potter's clay and the unfired bowl.

"Apart from the obvious macroscopic differences the Black-and-White ware (e.g. Tularosa) is distinct from the Polychrome ware (e.g. St. Johns) in the following ways:

Tularosa	*St. Johns*
Has relatively more mineral grains and aggregates.	Has relatively less mineral grains and aggregates.
Has only very rare inclusions with opaque spherules about .008 to .012 mm. across.	Has common peculiar (?sherd) inclusions which are charged with opaque hematitic spherules about .008 mm. across.
Has a white fired slip, which becomes only light pink on re-firing in oxidation atmosphere.	Has a dark red slip produced from a limonitic clay (p. 130).
Has a gray color to body, which becomes pink to light red on re-firing in oxidation atmosphere.	Has a buff to light red body, which becomes grayish after re-firing in reducing atmosphere. (Slip becomes black because of reduction of iron oxides.)
Buff or red colored sherd temper very rare; black-on-white sherd temper common.	Red colored and gray sherd temper both common although this depends on depth of oxidation; black-on-white sherd temper occurs.

"It thus seems that Tularosa ware was fired in a reducing atmosphere, while St. Johns was fired in an oxidizing one. This has to be borne in mind when comparing the two wares. A different slip was used for the wares and it appears that the pastes of the wares also differ. It is difficult to suggest a definitive source for the mineral grains and aggregates, particularly in the Tularosa ware. A proportion of it appears rather (silt to sand) large to be a normal constituent of many clay deposits, but it is possible that some would find its way into the raw material from included sand seams on lenticles in the deposit. If, however, the raw clay was treated to remove coarse materials and other undesirable matter such as organic debris, the original sand would be practically all removed. The

clay for the St. Johns ware may thus have been treated, but that for the Tularosa wares probably would not have been. Some of the mineral grains and aggregates are probably derived from the crushing of sherds for temper when many of the mineral grains would be freed from the paste and incorporated into the new pots along with the sherd temper. The differing proportion of grains in the two types of wares is difficult to explain. Either different deposits were used, one of which contained more sand than the other and which was not removed by treatment, or else the grains were introduced; for example, with the crushed sherd temper. In the latter case the small proportion in the St. Johns ware would require that relatively little black-on-white sherd temper was used in that ware.

"The potter's clay and unfired bowl have the following characteristics:

Potter's Clay	*Unfired Bowl*
Has relatively much more of mineral grains and aggregates.	Has relatively much less of mineral grains and aggregates.
Has only very rare inclusions with opaque spherules.	Has common peculiar (?sherd) inclusions which are charged with opaque hematilic spherules about .006 mm. across.
Fires pink to red in oxidizing atmosphere.	Fires buff to red with a deep red slip (originally brown) in oxidizing atmosphere (p. 130).
Contains abundant sherd inclusions, both red colored and with red slip and gray with black-on-white surfaces.	Contains abundant sherd inclusions, both red colored and with red slip and gray with black-on-white surfaces.
Fired grayish in a reducing atmosphere. Red and brown colored sherd inclusions are nearly absent.	Fired grayish in a reducing atmosphere. Red and brown colored sherd inclusions are practically absent.

"The potter's clay and the unfired bowl have differences similar to those of the Tularosa and St. Johns ware. The unfired bowl was obviously destined to be St. Johns ware as it agrees in all respects. As already noted (p. 131) the ball of potter's clay has many similarities to the Tularosa type. Although it contains red-slipped-sherd inclusions it is probable that when fired in a reducing atmosphere the potter's clay would produce pots similar to the Tularosa type. The raw clays of both the ball of potter's clay and the unfired bowl could have been obtained from the same deposit and the same locality (p. 130). The varying mineral grain content of the two samples may be explained by different methods of treatment of the raw clay; e.g. the clay used for the unfired bowl could have been winnowed to remove coarse and undesired particles while that for the potter's

clay was not. This seems an unlikely explanation. The difference in mineral grain content (and a small percentage is characteristic of St. Johns ware as well as the unfired bowl), however, may be explained by the two samples having been obtained from different localities in basically similar clay deposits, and the clay being used untreated in both cases. If many of the mineral grains were introduced along with the sherd temper, then relatively little black-on-white temper should be present in the unfired bowl. A count of 479 slipped coarse and medium sand-sized (1.00.25 mm.) sherd temper particles from the unfired bowl (only slipped pieces were counted to ensure certainty in identification) showed 96 (20 per cent) black-on-white and 383 (80 per cent) red-slipped particles.

"In the coarse sand fraction (1.0–.5 mm.) of the potter's clay 266 slipped sherd particles were examined, of which 52 (nearly 20 per cent) were black-on-white and 214 (80 per cent) were red-slipped particles. The proportions of the two types are thus the same in the potter's clay and the unfired bowl. This similarity may be just chance or else it is indicative of the relative quantities of the two types of wares. As the polychrome ware is slipped on both surfaces (bowls) and the Tularosa Black-on-White ware (jars) usually is not, there would be relatively greater amounts of red-slipped particles produced than of the black-on-white from the same quantity of pottery of each type; however, the preponderance of red-slipped particles noted in the counts indicates that polychrome ware exceeded black-on-white in the material crushed for temper. The relatively low proportion of black-on-white particles in the potter's clay supports the idea that the bulk of the mineral grain inclusions were natural ingredients of the raw clay. This conclusion may well also apply to the Tularosa ware. It is indeed possible that the potter's clay was destined to be a Tularosa type black-on-white pot.

"Tiny magnetite octahedra occur in the fine sand fraction of the potter's clay and the unfired bowl. It is possible that these are produced during the firing, particularly in a reducing atmosphere. They would then have been introduced into these two specimens along with the sherd temper."

Significance of Pottery Types from Hooper Ranch Pueblo
(Figures 89–95)

The complete sherd counts for all rooms and levels have been published (Martin, Rinaldo, and Longacre, 1960).

With this report is published, however, a table showing total sherd counts by types for the Hooper Ranch Pueblo as a whole, without regard to level (pp. 145–146).

A glance at this table indicates that the most popular decorated type was Tularosa Black-on-White (13.55 per cent of all sherds), with St. Johns Polychrome (2.93 per cent), Pinedale Black-on-Red (2.78 per cent), Heshota-uthla Polychrome (2.46 per cent) and Pinedale Polychrome (1.88 per cent) decreasing markedly in popularity.

Brown culinary wares, especially plain corrugated (14 per cent) and indented corrugated, sometimes with smudged interiors (29 per cent), were abundant. Gray indented corrugated was rare. Curiously, Alma Plain and San Francisco Red wares were scarce, whereas they were fairly abundant at Table Rock Pueblo (Martin and Rinaldo, 1960b), and Table Rock Pueblo is surely later in time than the site at Hooper Ranch.

More sherds were found in Kiva I, the larger, than in Kiva II. Rocks from fallen walls had apparently filled Kiva II soon after abandonment of the Pueblo, leaving no space for sherd-fill. Kiva I, on the other hand, being farther removed from the pueblo, contained fewer wall stones but did contain a good quantity of dirt and sherds that had worked down into it.

We had hoped that study of the sherd counts from various levels and floors might tell us the building or occupational dates for the rooms on the lower levels and the later rooms in the top levels. This hope was not fulfilled, mostly because we lack precise incipient and terminal dates or sequence for any of the pottery types that we found. Since most of the best time indicators—Four Mile Polychrome, Heshota-uthla Polychrome, Kwakina Polychrome, Pinedale Polychrome, St. Johns Polychrome and Tularosa Black-on-White—occur often in clusters of varying combinations in many of the rooms, we cannot date any section or room with precision, but must be content with a date that will hold for the whole site and that spans perhaps a generation or more. All we are certain of is that the ground floor rooms were built first.

The generally accepted dates (Flagstaff pottery conference, 1959) of our sensitive pottery types are: Four Mile Polychrome, A.D. 1350–1400; Heshota-uthla Polychrome, A.D. 1300–1400; Kwakina Polychrome, A.D. 1300–1375; Pinedale Polychrome, A.D. 1275–1300; St. Johns Polychrome, A.D. 1150–1250; Tularosa Black-on-White, A.D. 1100–1250.

Comparison of the percentages of the types from Foote Canyon (Rinaldo, 1959) and from Table Rock (Martin and Rinaldo, 1960b) indicates that the Hooper Ranch Pueblo is older than Table Rock Pueblo and perhaps of the same age as or slightly younger than Foote Canyon Pueblo.

The tentative dates for Foote Canyon are A.D. 1245–1350; and for Table Rock A.D. 1350–1400. On this level of reckoning I would guess that Hooper Ranch Pueblo would date at about A.D. 1200–1375.

FIG. 89. Sherds from Hooper Ranch Pueblo; Reserve Black-on-White.

FIG. 90. Sherds from Hooper Ranch Pueblo; Tularosa Black-on-White.

FIG. 91. Sherds from Hooper Ranch Pueblo; St. Johns Polychrome.

FIG. 92. Sherds from Hooper Ranch Pueblo; Pinedale Black-on-Red.

Fig. 93. Sherds from Hooper Ranch Pueblo; Pinedale Polychrome.

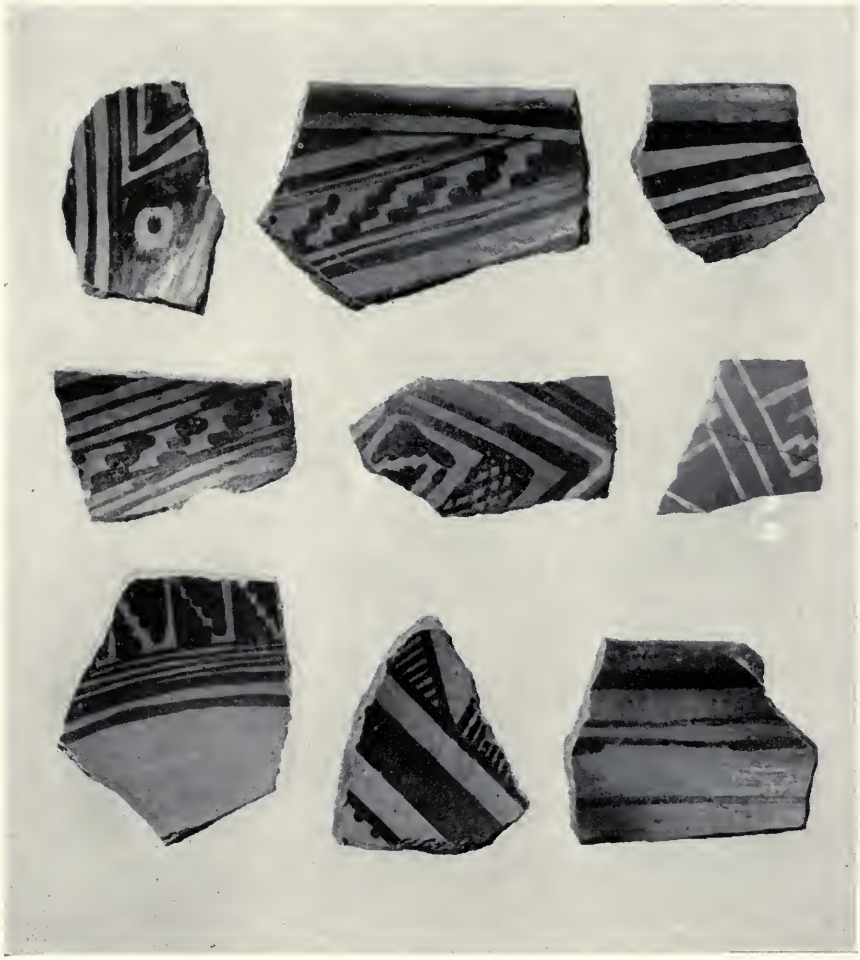

FIG. 94. Sherds from Hooper Ranch Pueblo; Heshota-uthla Polychrome.

FIG. 95. Sherds from Hooper Ranch Pueblo. Top row: Kwakina Polychrome. Middle row: Kwakina Polychrome type, interior, and Houck Polychrome type, exterior. Bottom row: Houck or Querino Polychrome type, interior, and Houck Polychrome type, exterior.

I might conjecture further that the lower, earliest rooms might have been built about A.D. 1275 or earlier, since they contained little or no Pinedale Polychrome.

SUMMARY

Three whole vessels and 6,881 sherds were recovered from the Mineral Creek Site. The most popular decorated types were Snowflake Black-on-White, Reserve Black-on-White, and Tularosa Black-on-White. The most abundant culinary types were brown indented corrugated and Alma Plain, Forestdale variety.

Mr. Bertram Woodland made petrographic examinations of 17 thin sections of pottery from Mineral Creek Site. Analysis of the paste and the inclusions in it indicated that petrographically Snowflake and Reserve Black-on-White are similar and both contain moderate amounts of sherd temper plus other mineral grains and aggregates.

The Alma Plain, brown plain corrugated, and McDonald Corrugated are similar and were perhaps fired at a somewhat lower temperature than were the Snowflake and Reserve Black-on-White.

The San Francisco Red stands somewhat apart from other types from Mineral Creek Site, but there is considerable likeness between it and the Pinedale Polychrome and Snowflake and Reserve Black-on-Whites. The San Francisco Red may have been an imported piece from the Kinishba area.

A tentative and conjectured date, based solely on estimated dates for the pottery types, is suggested for the Mineral Creek Site; it is A.D. 1000–1200.

Sixteen restorable vessels and 13,422 sherds were excavated from the Hooper Ranch Pueblo.

The most popular decorated types were, in descending order of frequency: Tularosa Black-on-White, St. Johns Polychrome, Pinedale Black-on-Red, Heshota-uthla Polychrome, and Pinedale Polychrome.

Mr. Woodland also made a petrographic examination of 26 thin sections of sherds from Hooper Ranch Pueblo. His analysis suggested that:

Tularosa Black-on-White, Kwakina Polychrome and a section of potter's clay are strongly similar.

St. Johns Polychrome and the unfired bowl (clay sample no. 2) are almost identical.

Heshota-uthla Polychrome and Kana-a Gray have many characteristics in common, although they vary in minor ways.

Pinedale Polychrome resembles to a considerable degree three types found at Mineral Creek Site: San Francisco Red, Snowflake Black-on-White, and Reserve Black-on-White.

The indented corrugated is somewhat similar in texture and inclusions to the culinary wares from the Mineral Creek Site, but the relationship is not close.

It is possible that Heshota-uthla Polychrome, Kana-a Gray, and Pinedale Polychrome are trade types.

The potter's clay (sample no. 1) and the unfired pottery bowl (sample no. 2) were intensively examined by Dr. Forslev. The analysis indicates that both samples came from the same deposit but perhaps from different places in the bed. It may be that the larger particles had been removed by some process (winnowing or soaking) and that to the clay residue about 30 per cent (by weight) of sherd temper had been added.

A "paint" substance also found in the pueblo was found to be a mixture of kaolin clay and iron oxides. Upon proper treatment and firing, a sample of this substance turned a red identical to the red slip of a St. Johns Polychrome piece.

From these studies, it is conjectured that the potter's clay might have been used to produce a piece of Tularosa Black-on-White or a Kwakina Polychrome. The unfired bowl was certainly destined, if appropriately slipped and fired, to be what we call St. Johns Polychrome.

It is conjectured that Hooper Ranch Pueblo was occupied between A.D. 1200 and A.D. 1375. The earlier portions may have been built before A.D. 1275 because little or no Pinedale Polychrome (A.D. 1275–1300) was found in them.

LIST OF POTTERY TYPES

Alma Incised (Haury, 1936b, p. 40; Hawley, 1936, p. 106; Nesbitt, 1938, p. 138).

Alma Neck Banded (Haury, 1936b, pp. 35–36).

Alma Plain (Gladwin, W. and H. S., 1934, p. 18; Haury, 1936b, p. 32; Hawley, 1936, p. 104; Martin and Rinaldo, 1947, pp. 362–368; Nesbitt, 1938, p. 137).

Alma Punched (Haury, 1936b, p. 39; Hawley, 1936, p. 106; Nesbitt, 1938, p. 138).

Alma Scored (Haury, 1936b, p. 38; Hawley, 1936, p. 106; Martin and Rinaldo, 1950a, p. 359; Nesbitt, 1938, p. 138).

Brown plain corrugated, brown plain and indented corrugated, and brown indented corrugated; equivalent to Reserve Plain Corrugated, Tularosa Patterned Corrugated, smudged interior (Rinaldo and Bluhm, 1956, pp. 155, 159, 169).

Chaco Canyon Pottery, "Chacoan" Black-on-White (Judd, 1954, pp. 174–238).

Four Mile Polychrome (Colton and Hargrave, 1937, p. 109; Gladwin, W. and H. S., 1934, pp. 18–19; Hawley, 1936, p. 72; Reed, 1955, p. 184; Stubbs and Stallings, 1953, p. 154, fig. 70).

Heshota-uthla Polychrome (Colton and Hargrave, 1937, p. 114; Hawley, 1936, p. 76; Stubbs and Stallings, 1953, p. 154, chart).

Houck Polychrome (Roberts, 1932, pp. 111–112).

Jeddito Black-on-Orange (Colton and Hargrave, 1937, p. 142).

Jeddito Black-on-Yellow (Colton and Hargrave, 1937, p. 150).

Kana-a Gray (Colton and Hargrave, 1937, pp. 195–196).

Kiatuthlanna Black-on-White (Gladwin, 1945, pp. 41–42; Roberts, 1931, pp. 130–149).

Kwakina Polychrome (Colton and Hargrave, 1937, pp. 115, 117; Reed, 1955, p. 190; Stubbs and Stallings, 1953, chart, p. 154; Woodbury, Drs. N. and R., MS.).

McDonald Corrugated (Colton and Hargrave, 1937, p. 61).

Pinedale Black-on-Red (Colton and Hargrave, 1937, p. 106).

Pinedale Polychrome (Colton and Hargrave, 1937, p. 107; Gladwin, W. and H. S., 1934, p. 19; Hawley, 1936, p. 72; Stubbs and Stallings, 1953, p. 154).

Pinnawa Polychrome (Colton and Hargrave, 1937, p. 116; Reed, 1955, p. 190; Woodbury, Drs. N. and R., MS.).

Puerco Black-on-Red (Colton and Hargrave, 1937, p. 120).

Querino Polychrome (Colton and Hargrave, 1937, pp. 121–122; Hawley, 1936, p. 44; Roberts, 1932, p. 111).

Red Mesa Black-on-White (Gladwin, 1945, pp. 56–57; Martin and Willis, 1940, pls. 66–67).

St. Johns Polychrome (Gladwin, W. and H. S., 1931, pp. 36–40; Hawley, 1936, p. 49; Martin and Willis, 1940, pls. 97–101).

San Francisco Red, Saliz Variety (Haury, 1936b, pp. 28–31; Martin, 1943, p. 240; Martin and Rinaldo, 1940, pp. 80–81; 1947, pp. 364–368).

San Francisco Red, smudged interior (3 sherds); variety of San Francisco Red?

Show Low Black-on-Red (Colton and Hargrave, 1937, p. 78; Haury and Hargrave, 1931, p. 27).

Snowflake Black-on-White (Colton, 1941, p. 62).

Springerville Polychrome (Danson, 1957, p. 93).

Three Circle Neck Corrugated (Haury, 1936b, p. 36; Hawley, 1936, p. 105).

Tularosa Black-on-White (Gladwin, W. and H. S., 1931, pp. 32–35; Hawley, 1936, pp. 46–47; Kidder, 1924, p. 98; Nesbitt, 1938, p. 139; Rinaldo and Bluhm, 1956, pp. 177–184).

Tularosa Fillet Rim (Gladwin, W. and H. S., 1934, p. 18; Kidder, 1924, p. 98; Martin, *et al.*, 1952, p. 65; Wendorf, 1950, p. 121).

Tularosa White-on-Red (Martin, Rinaldo, and Bluhm, 1954, p. 73; Rinaldo and Bluhm, 1956, p. 173).

White Mound Black-on-White (Gladwin, 1945, pp. 22–23).

Wingate Black-on-Red (Gladwin, 1931, pp. 29–31; 1945, pp. 71–73; Martin and Willis, 1940, pls. 89–96).

TOTAL SHERD COUNTS FOR MINERAL CREEK SITE AND HOOPER RANCH PUEBLO[1]

Pottery type	Mineral Creek Site		Hooper Ranch Pueblo	
Decorated wares	No.	%	No.	%
Chaco B/W	..	..	3	.02
Four Mile Poly	..	..	79	.59
Gila B/R	..	..	1	.01
Gila Poly	..	..	6	.04
Heshota-uthla Poly	..	..	333	2.46
Houck Poly	..	..	4	.03
Jeddito B/O	..	..	1	.01
Jeddito B/Y	..	..	3	.02
Kwakina Poly	..	..	102	.76
Kiatuthlanna B/W	42	.61	3	.02
Matsaki Poly	..	..	4	.03
Mimbres Bold Face B/W	..	..	1	.01
Pinedale B/R	..	..	375	2.78
Pinedale Poly	..	..	254	1.88
Pinnawa G/W	..	..	8	0.6
Pinto Poly	..	..	1	.01
Puereo B/R	..	..	15	.11
Puereo B/W	7	.10	1	.01
Querino Poly	1	.01	12	.09
Red Mesa B/W	29	.42	22	.16
Reserve B/W	199	2.89	106	.78
Roosevelt B/W	...	..	2	.02
St. Johns Poly	1	.01	396	2.93
Show Low B/R	...	..	14	.10
Snowflake B/W	366	5.31	15	.11
Springerville Poly	...	...	9	.07
Three Circle R/W	3	.04	...	...
Tonto Poly	...	...	2	.02
Tularosa B/W	126	1.83	1832	13.55
Tularosa W/R	...	...	15	.11
White Mound B/W	7	.10	3	.02
Wingate B/R	38	.55	83	.61
Indet. B/R	88	1.28	1098	8.13
Indet. B/W	1926	27.93	662	4.90
Indet. G/R	....	.....	66	.49
Indet. Kwakina; Ext. Houck	....	.....	7	.05
Indet. Kwakina; "Cream Colored"	....	.....	20	.27
Indet. Kwakina; Ext. Four Mile	....	.....	2	.02
Indet. Painted	....	.....	356	2.63
Indet. Red	....	.....	25	.19
Indet. W/R	....	.....	33	.24
Indet. Poly	....	.....	54	.40
Totals of decorated types	2833	41.08	6035	44.66

[1] For tabulations by rooms, levels, and trenches see Martin, Rinaldo, and Longacre (1960).

TOTAL SHERD COUNTS FOR MINERAL CREEK SITE AND HOOPER RANCH PUEBLO (*continued*)

Pottery type	Mineral Creek Site		Hooper Ranch Pueblo	
Textured wares	No.	%	No.	%
Alma Scored	1	.01	...	...
Alma Neck Banded	17	.25	3	.02
Brown Plain Corr.	273	3.96	1906	14.10
Brown Plain Corr. Sm. Int.	51	.74	99	.73
Brown Plain and Ind. Corr.	...	...	235	1.74
Brown Plain, Sm. Int.	...	...	3	.02
Brown Ind. Corr.	1411	20.46	3454	25.56
Brown Ind. Corr. Sm. Int.	377	5.47	557	4.12
Gray Plain Corr.	75	1.09	8	.06
Gray Ind. Corr.	69	1.00	3	.02
Gray Patt. Corr.	4	.06	..	..
Incised Corr.	1	.01	..	..
Kana-a Gray	..	..	1	.01
Linden Corr.	3	.04	..	..
McDonald Corr. Plain	30	.44	3	.02
McDonald Corr. Ind.	96	1.39	27	.20
McDonald Corr. Patt.	20	.29	..	..
Patterned Corr.	97	1.41	50	.37
Punched Corr.	2	.03	1	.01
Three Circle Neck Corr.	12	.17	..	..
Tularosa Fillet Rim	..	..	4	.03
Indeterminate Corr.	176	2.55	141	1.04
Totals of textured types	2715	39.37	6495	48.06
Plain wares				
Alma Plain	1284	18.62	688	5.09
Forestdale Smudged	5	.07	..	..
San Francisco Red	15	.22	1	.01
San Francisco Red Sm. Int.	3	.04	..	..
Woodruff Smudged	4	.06	8	.06
Indeterminate	25	.36	5	.04
Indeterminate Red	..	..	190	1.41
Totals of plain wares	1336	19.37	892	6.61
Totals of textured wares	2715	39.37	6495	48.06
Totals of decorated wares	2833	41.08	6035	44.66
Grand totals	6884	99.82	13,422	99.33

V. An Archaeological Survey

In the Upper Little Colorado Drainage of East-Central Arizona

ACKNOWLEDGMENTS

I wish to thank Drs. Paul S. Martin and John B. Rinaldo of Chicago Natural History Museum. It was at their suggestion that the survey was undertaken. Their constructive criticisms and stimulating comments during the course of this study are greatly appreciated.

In an archaeological survey of an extensive area, such as that undertaken in this study, the archaeologist must rely upon the aid of local people: amateur archaeologists, local historians, and people who know the area intimately. During the course of this survey many people gave me time, advice, and information. I wish to express my sincere gratitude to all those who provided aid: Mrs. Jewel Cowley and Mrs. Leola Mineer, of St. Johns; Mr. and Mrs. Wayne Brinkerhoff, Mr. William Castro, and Mr. and Mrs. Harvey Wilhelm, of Snowflake; Mrs. E. Highwood and her father, Mr. Gilbert Sogge, of Springerville; and Mr. and Mrs. Vincent Butler, of the Butler Ranch, south and west of Springerville.

Special thanks are due Mr. Leigh Richey and his family, of St. Johns. Mr. Richey and his son, Robin, spent many days accompanying me on the survey. Their knowledge of the country greatly facilitated this study. In addition, they kindly allowed me to camp on their land, where I enjoyed many wonderful meals cooked by Mrs. Richey.

Several people gave freely of time and advice in the preparation of this report: Dr. Robert M. Adams of the University of Chicago; Dr. Elaine A. Bluhm of the University of Illinois; Dr. B. L. Fryxell of the Michigan College of Mining and Technology; and Dr. Arthur Jelinek of the University of Chicago. Their valuable suggestions and criticisms are gratefully acknowledged.

INTRODUCTION

For an archaeological understanding of an area, two steps are necessary. Ideally, the first is an intensive archaeological survey, placing sites in space and approximate time. The aim of the survey is to locate sites giving the archaeologist knowledge of prehistoric populations, temporal occupational differences showing changing settlement patterns, geographic-spatial preference, and perhaps population shifts. The second is the excavation of select sites by the archaeologist as directed by his particular interests and problem orientation.

It is the task of the archaeological survey, then, to give the background information necessary to the understanding of an archaeological area. It should suggest problems concerning population and settlement pattern through time. The survey suggests sites that should be excavated in the light of the background information gained.

For these reasons it was decided to incorporate an archaeological survey into the 1959 field season of the Museum's Southwestern Expedition.

Martin and Rinaldo, interested in the delimitation of the Mogollon culture, spent fifteen field seasons working in and near the Pine Lawn Valley in western New Mexico. They began their study when the question of Mogollon culture as a separate entity from the northern Anasazi and desert Hohokam was the subject of many a heated debate, and their work aided an understanding of the Mogollon sequence as we know it today. When they discovered that the area had been abandoned by approximately A.D. 1350 they became interested in the later settlement of these people. Suspecting that the most logical route for migration lay to the north and west, they made preparations to move their base camp from the Pine Lawn Valley to the Upper Little Colorado River area of northeastern Arizona, a relatively little-known region, archaeologically.

Moving to Vernon, Arizona, a central location in the area considered, they decided to begin an archaeological survey as quickly as possible. Dr. Rinaldo spent part of the first summer surveying the Vernon-Little Colorado area. It proved impracticable to extend this project into the following season. However, it was felt that the survey should be continued, as the problems suggested by Dr. Rinaldo's work aroused our curiosity and interest.

Two months of the summer field session of 1959 were spent in an archaeological survey of an area encompassing more than 300 square miles; 2,000 miles were driven and 107 sites located. It is hoped that the results, studied in the light of Rinaldo's work and several other surveys of areas related to the one under consideration, will bring about a better understanding of the prehistoric occupation of this region.

The area covered extends from St. Johns to Springerville in the Little Colorado River Valley and westward as far as Snowflake; it includes the large triangular area outlined by highways 60 and 260 as they merge east of Show Low, the right side of the triangle being highway 666–260 between Springerville and St. Johns (fig. 96).

It was decided to divide the survey work arbitrarily into three geographic areas: the Little Colorado Valley, the rough triangle outlined above, and the Snowflake-Mesa Redonda area. It was felt that if there were differences in occupation in the total region, a division of this sort might indicate this fact more sensitively.

ORGANIZATION

One of the difficulties encountered in the preparation of this report has been the problem of terminology.

The first problem was that of the definition of a site. For purposes of this study it was decided to define a site as an area used by prehistoric peoples as indicated by cultural detritus. This definition would include areas of occupation ranging from small camp sites with no evidence of architecture to large above-ground structures of more than 100 rooms.

The second problem was that of the treatment of sites with several occupations, especially when the occupation was in an unbroken sequence through time. It was decided to record each site only once, and later each site was broken down into occupational components and labeled *a*, *b*, *c*, etc., on the basis of the pottery analysis. When this was done, the 107 recorded sites expanded to 154 temporally different components.

The third problem was that of determining the age of the sites. The Pecos Classification proved to be unsatisfactory, because it was too general. The discrepancy between time and cultural inclusion in it is recognized; also phase-designation has come to be accepted by most archaeologists in the Southwest. Since information gained from excavation is unfortunately lacking in the surveyed area, I could not justify an attempt to assign phases to the area.

It was decided to present the material in the form of rough time periods based upon admittedly arbitrary "groups" with dated pottery types or the absence thereof as the delimiting factors. It is hoped that the presentation of the material in this manner will better facilitate a later incorporation into future archaeological studies within the area.

The use of the term "group" here does not connote the exact meaning that Colton gave "Ceramic Group" in 1946 (Colton, 1946a, pp. 18–20). Colton uses this term to refer to ". . . an assemblage of contemporary,

usually painted, pottery types recognized at a site of short occupation." (loc. cit., p. 18). Below is a list of groups, pottery inclusion, and tentative dates:

Group I.—Pre-pottery: Absence of pottery, stemmed projectile points with concave bases, various tools such as choppers, scrapers, and knives. Dates: 2000 B.C.–A.D. 500.

Group II.—Pottery: Plain Wares. Reserve Series and Tsegi Series. Dates: A.D. 500–700.

Group III.—Pottery: White Mound Black-on-White, Kiatuthlanna Black-on-White, Red Mesa Black-on-White. Dates: A.D. 700–900.

Group IV.—Pottery: Reserve Black-on-White, Snowflake Black-on-White, Wingate Black-on-Red. Dates: A.D. 900–1100.

Group V.—Pottery: Tularosa Black-on-White, St. Johns Polychrome. Dates: A.D. 1100–1300.

Group VI.—Pottery: Zuni Glazes, Pinedale Polychrome, Pinedale Black-on-White. Dates: A.D. 1300–1500.

FIELD PROCEDURE

Each site visited was given a survey number. A random collection of pottery and/or artifacts was made. The site was carefully described as to its extent, condition, topographic-geographic setting, and spatial location. The pottery and artifacts were sorted and where possible were placed into described types and counted. All the above information was entered on "Site Cards." The collections and cards for each site are available in the Department of Anthropology, Chicago Natural History Museum. The pottery analysis and artifact count along with a description of each site is published on microcards (Martin, Rinaldo, and Longacre, 1960).

TOPOGRAPHIC-ECOLOGICAL SETTING

The region investigated in this survey occupies a portion of the Colorado Plateau in east-central Arizona. It includes part of the upper drainage of the Little Colorado River and portions of several of its tributaries. It is roughly outlined by parallels 34° 30′ on the north and 34° 20′ on the south, with meridians 109° 20′ and 110° the approximate eastern and western boundaries, respectively.

Semi-arid conditions prevail at the present time over most of the region, except in the mountainous area to the south. However, there is actually a high degree of climatic variation within the area. Harrell and Eckell (1939) suggest that this is due to a combination of variation in altitude and local modification caused by secondary topographic features. Summer is the rainy season with the usual pattern of local thundershowers. The season with the least precipitation is spring. Average

summer precipitation is usually around six inches; winter snowfall, twenty-three inches of unmelted snow (op. cit., pp. 24–26).

Four broad vegetation groups are found in the region: the northern desert shrubs (chiefly in the Little Colorado River Valley); the short grasses (extensive on the plains and mesas at altitudes of 5,000 to 6,000 feet); Southwest coniferous woodlands (pinyon-juniper association occupying mesas, lower mountain slopes, and breaks); and forest (yellow pine and Douglas fir found on the higher plateau and mountains) (op. cit., pp. 26–27).

The whole surveyed area would fit into the two Life Zones described by Bailey (1913). Most of the country would be described as Upper Sonoran, and the higher country to the south belongs to the Transition Zone.

From its origin in the White Mountains the Little Colorado River flows northward, and it has dissected a great valley in the surface of the plateau. At Springerville the valley opens into a rather extensive "round valley," north of which it narrows considerably, forming a deep, rugged gorge. Approximately four miles north of Springerville, the canyon again opens into a broad valley, a well-watered, fertile area. Northward this valley again narrows abruptly, forming a deep and narrow gorge which continues for approximately seven miles and then opens into a broad, rich valley. Here, there is a settlement known as Richville, where water is again plentiful. North of Richville, the river enters a gorge and then flows into another broad valley, for the most part taken up by the waters of the Lyman Dam. North of the dam, the river valley is not so narrow as the canyons to the south. The geological formations change also from the dominant igneous landscape to one more sedimentary in origin. By the time the waters of the Little Colorado reach St. Johns, they are flowing through a very broad, flat valley. Flowing from the White Mountains, the river traverses rolling igneous country dominated by huge cinder cones, lava flows, and basalt-capped mesas. Here the country is relatively devoid of trees except on the higher ridges and on some cinder cones. The flat areas are littered with basalt boulders and the cover is short grass, scattered shrubs, and an occasional juniper. As the valley approaches St. Johns, the dominant igneous landscape grades into the Chinle and Moenkopi sedimentary sandstones.

The triangular region bounded by highway 260 on the north, 60 on the south, and 666 on the east is a very rugged area predominantly igneous in nature. A broad river valley runs northward in the approximate center of the "Triangle." This valley is bounded on the south and west sides by a basalt-capped mesa. Numerous springs appear at the point of contact of the basalt with the underlying sedimentary formations.

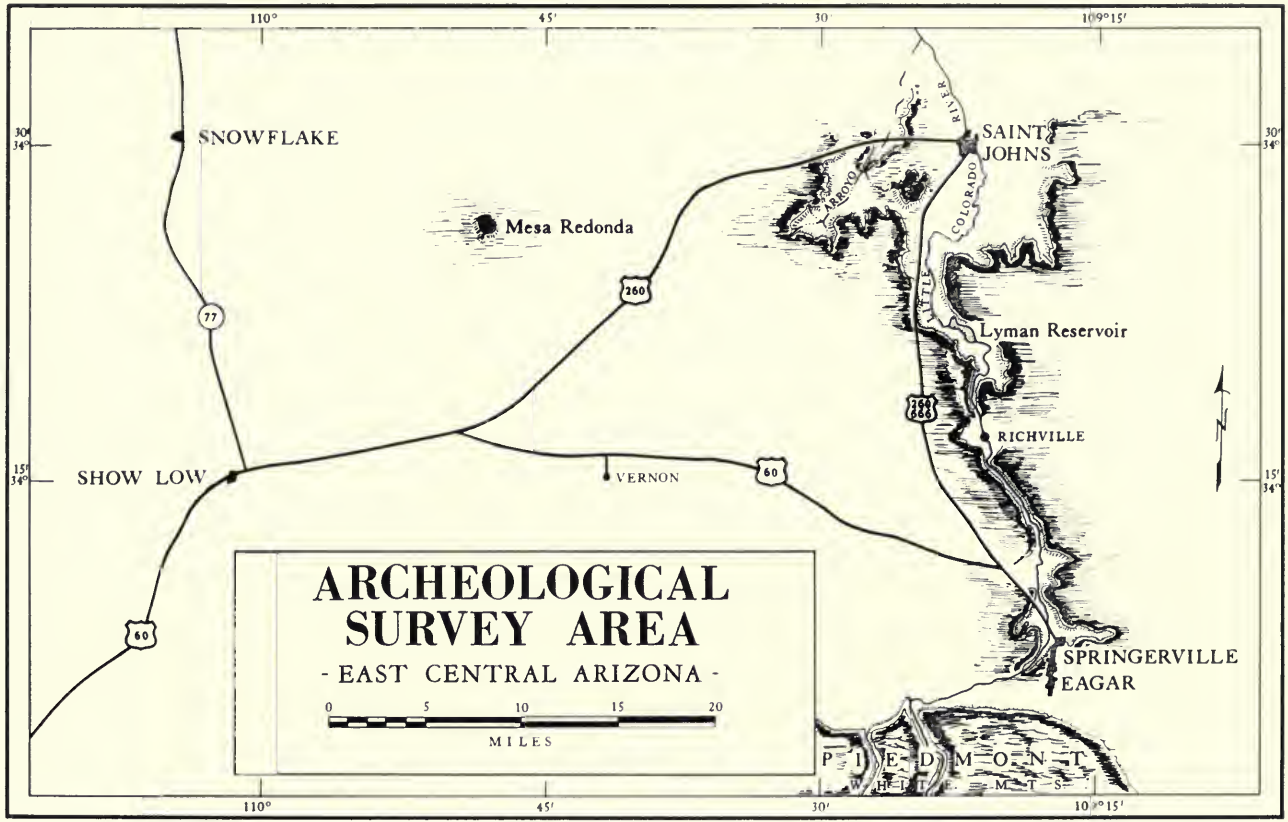

FIG. 96. Area covered by archaeological survey, east-central Arizona.

Within the "Triangle" are the remnants of several lakes in the form of dry lake beds. These, along with the extensive river valley and sundry dry washes, give evidence of a wetter climate in the past.

The Snowflake area is predominantly sedimentary in nature. Many of the larger mesas, however, are capped with basalt. The area is heavily dissected with rivers which for the most part are now dry washes. These rivers have cut an extensive valley system throughout this area. The valleys are broad and relatively flat. This would argue for a much wetter climate at some point in the past.

Most of the time during the season was spent in the Little Colorado River Valley, which extends from the St. Johns area north to Springerville. Two days were spent in the foothills of the White Mountains south and west of Springerville. The field work in this area was of a fairly intensive type. The survey in the triangle was limited by lack of time, and much of the work here was extensive reconnaissance. The approximate center of this area—the river valley and especially the surrounding mesas—was treated rather intensively. Less than a week was spent in the Snowflake-Mesa Redonda area, but all work done there was intensive.

THE LITTLE COLORADO RIVER VALLEY

No published reports of excavated sites in the portions of the Little Colorado River drainage considered in this survey are known, but Spier (1919) has reported locations of several ruins on the Little Colorado which are in the considered area.

As mentioned above, the Little Colorado flows through several broad valleys between which the canyon narrows considerably, forming a rugged, deep gorge. Prehistoric population clusters were found in the broad, fertile valleys; the narrow canyons were almost devoid of evidence of prehistoric occupation.

In the Little Colorado Valley, 106 components were located. These include 11 pre-pottery components (Group I), 6 Plain Ware components (Group II), 27 of the early Black-on-White components (Group III), 39 of the Reserve Black-on-White components (Group IV), 19 Tularosa Black-on-White components (Group V), and 4 components with Zuni Glazes (Group VI).

Of the 11 pre-pottery components, four were located on ridges or knolls on the valley floor, three were on the sides of mesas on grassy parks or "benches," two were on a ridge or hill on top of the bluffs overlooking the valley, one was on the flats in the river bottom, and one was on the bluff edge overlooking the valley. The 11 sites were located in three of

the broad valleys: at St. Johns, at Lyman Dam, and at Richville. No pre-pottery sites were located south of Richville on the Little Colorado.

Only six Plain Ware sites were found on the Little Colorado. Of these, five were dominantly Brown Ware sites, including one "Pure" Brown Ware site. Three were located on the flat of the river bottoms, one was on a flat area on the side of a mesa, and one was on the bluff overlooking the valley. Two of the Brown Ware sites occurred in the foothills of the White Mountains south and west of Springerville, the other three in the St. Johns area. No sites were found between. The one Gray Ware site (a "pure" Gray ware site) which was located is on a hill in the valley bottom in the first broad valley north of Springerville.

Twenty-seven components of Group III, the early Black-on-White association, were found. Of these, nine were on hills or ridges on the valley floor, nine were down on the valley floor, eight were on the bluffs overlooking the river, and one occurred on a "bench" on the side of a mesa. These sites were located in the four valleys from St. Johns south to the first broad valley north of Springerville with the concentration decreasing as one proceeded south from St. Johns.

A total of 39 components of the Reserve–Snowflake Black-on-White association (Group IV) is reported. Of these, 15 were found on hills or ridges on the valley floor, 11 on the flats of the river valley itself, 11 on the bluffs overlooking the valley, and 2 on flats on the sides of mesas. These sites were located throughout the surveyed area in the Little Colorado Valley from St. Johns to the White Mountains.

Nineteen Group V (Tularosa Black-on-White association) components were located. Eleven were found on hills or ridges on the valley floor, six on bluffs overlooking the river, and two on flat areas on the sides of mesas. All these sites were located in the valley surveyed from St. Johns to the White Mountains.

Of the Late components, those with Zuni Glazes, only four were located, and all of these were in the Little Colorado River Valley. Three were found on hills on the valley floor and one was on a bluff overlooking the river. This tabulation does not include the Table Rock Site excavated by the Museum in 1958 nor the Hooper Ranch Site (1959 field season of the Museum).

THE TRIANGLE

Eleven pre-pottery sites (Group I) were located within the limits of the triangle outlined above. Of these, three were on flat areas on the sides of mesas, three on hills or ridges on the valley floor below mesas, two

on the floor of the valley, two on the north shores of dry lake beds, and one on a bluff overlooking the valley below.

Only four Plain Ware components (Group II) occurred in this area. One was a Brown Ware site on the side of a mesa and three were Gray Ware sites, one on the side of a mesa, one on a hill on the valley floor, and one on the valley bottom flats.

Four sites with early Black-on-White associations (Group III) were found in the triangle. Three of these were on flats on the sides of a mesa and one was on a hill in the valley bottom.

Of Group IV, Reserve–Snowflake Black-on-White association, three sites were located. Two of these were on the side of a mesa on a flat area, and one was on a hill in the valley bottom.

Three sites of Group V, Tularosa Black-on-White association, were found within the limits of the triangle. Two were on the sides of mesas and one was on a hill in the valley bottom.

No evidence of later occupation was observed.

SNOWFLAKE-MESA REDONDA

Only one pre-pottery site was located in this area. This site was on a hill in a river valley approximately six miles east of Mesa Redonda.

There were no Plain Ware sites (Group II) in this region.

Six sites of early Black-on-White association (Group III) were found. Of these, five were located on hills in river valleys and one was on the flat valley floor.

Eleven sites of Group IV, Reserve–Snowflake Black-on-White association, were found. Ten of these were located on hills in river valleys and one was on the valley bottom.

Five sites of Group V, Tularosa Black-on-White association, can be reported. All of these sites were located on hills down in the river valleys.

No later sites were found within the surveyed area.

POTTERY DISTRIBUTIONS

Plain Wares

The following discussion concerns itself with pottery types and not with the groups discussed above. Plain Wares were plotted for both Plain Ware sites and those sites which were predominantly Plain Ware sites.

1. *Plain Brown* (Reserve series): A concentration of Plain Brown Ware sites can be noted for the St. Johns valley. Seven Plain Brown Ware

sites (including those with only the early Black-on-White associations) were located here. One was noted at Richville, and three were in the foothills of the White Mountains. Three other Brown Ware sites were recorded, one in the triangle, and two east of Mesa Redonda. The greatest concentration was found in the broad flat valley in the northernmost region of the summer's work.

2. *Plain Gray* (Tsegi series): Plain Gray Ware sites were confined to the northern and eastern part of the surveyed areas. The largest concentration, seven sites, was found in the triangle: four at St. Johns, two in each valley at Lyman Dam and Richville, and one in the first valley north of Springerville. No sites with Lino Gray were found south of Highway 60 nor were any recorded west of Concho. Most of these sites had traces of Alma Plain as intrusive trade pottery and the Brown Ware sites show traces of Lino Gray.

From the above, it becomes apparent that the people making Gray Ware preferred the plateau country north of the White Mountains in the surveyed areas. The people who made Brown Ware lived in the plateau, seemingly among the gray paste users if they were contemporary, and also in the mountainous country to the south. Trade sherds of Gray are found in the Brown Ware sites in the foothills of the mountains; Alma sherds are found on Lino sites north of St. Johns in the valley.

Snowflake Black-on-White–Reserve Black-on-White

On the assumption that these two pottery types are roughly contemporary, it was decided to plot their distributions for the whole surveyed area. This was done with a most pleasing result so far as the limitations of this study go.

In the Little Colorado Valley from St. Johns to the first broad valley north of Springerville, Reserve Black-on-White is the dominant decorated pottery for this time period. Percentages range from 30 to 50. In this area, Snowflake Black-on-White is present but in obviously lesser amounts than Reserve.

Moving westward into the triangle, only one site with Snowflake Black-on-White was found. Reserve is still the dominant black-on-white for this period, but smaller percentages were noted in this area than in the Little Colorado Valley.

Near Mesa Redonda, sites yielded 20 to 30 per cent Snowflake Black-on-White with Reserve as a close second. In other words, the sites contain roughly equal amounts of both Reserve Black-on-White and Snowflake

Black-on-White. However, as one moves westward towards Snowflake, Reserve Black-on-White percentages abruptly drop and Snowflake Black-on-White increases to 50 per cent or more. All eight sites found near Snowflake fit this pattern.

In summary, larger amounts of Snowflake Black-on-White were found on sites as the survey moved westward and proportionally smaller quantities of Reserve Black-on-White.

Tularosa Black-on-White

Tularosa Black-on-White follows roughly the same distributional pattern as Reserve Black-on-White. It occurs with the later wares such as St. Johns Polychrome. In total perspective, Tularosa Black-on-White is not as abundant as Reserve Black-on-White, especially in the Snowflake area, which was abandoned at this time. It seems to be most concentrated on the later sites in the Little Colorado River Valley.

St. Johns Polychrome

Contrary to its name, this polychrome was not found to be concentrated in the St. Johns area. The survey showed St. Johns Polychrome concentrations at Richville and at Snowflake. Only one site was found with this type in the St. Johns Valley. The triangle yielded two St. Johns sites. The work this summer showed St. Johns Polychrome to be a widely scattered type occurring in almost the whole surveyed area. An interesting note is the fact that many of the sites with this pottery type are small, several-roomed units. Several in the Richville area are small, two- or three-roomed structures. One small cave located in the triangle yielded St. Johns Polychrome. It was also found on rather large ruins of more than 50 rooms.

SETTLEMENT PATTERN

Little Colorado Valley

A total of eleven pre-pottery sites was found. All but one were camp sites. Several had basin metates and one-hand manos on the surface. Preference at this time seems evenly divided between hills or ridges down in the valley and the sides of mesas on grassy flat areas, many of which have running springs today.

Of the eleven sites, one could be called fortified. It is located on top of a small mesa. Two sides are basalt cliffs; the other two have double basalt boulder walls. It is a pithouse village consisting of several rock-

outlined pithouses and is approached only with difficulty. Without the benefit of excavation, one can only speculate on the meaning of this site. If it is contemporary with the other pre-pottery sites in the area, it would present the problem of determining from whom these people were defending themselves. If excavation proves the site to be later, then it may represent an outpost or a refuge, well defended and with a commanding view of the valley below.

Both Brown Ware and Gray Ware sites were located in this area. The Gray Ware sites stop north of Springerville, and the Brown Ware sites continue south into the mountains. Small villages seem to be the dominant pattern for both groups. Brown Ware sites are usually located in the valley bottoms near washes, the Gray Ware sites on hills in the valley bottoms.

At the time of Group III, the early Black-on-White association, an abrupt increase in population may be noted. Twenty-seven sites were recorded. All were relatively small, from three to twenty-five rooms. Location seems equally divided between the valley bottoms, the hills in the valley bottom, or the bluffs overlooking the valley.

Population seemed to increase even more in later times if one is to judge from the increase of Group IV sites to 39 in this area. The size of these ruins is slightly larger than those of the previous time. Roughly the same preference is noted for location as was observed for the previous period. The sites seem about equally proportioned among the bluffs, the river valley floor, and the hills on the valley floor.

In this area, Group V sites drastically decline in number compared to those of Group IV. Only nineteen were recorded in the Little Colorado Valley, the greater number located on hills on the valley floor. However, the size of the villages had greatly increased, and perhaps smaller units such as familial or lineage units had begun to live together. The number of ruins decreases while the size increases. This could possibly indicate several things: (1) religious intensification requiring mutual assistance; (2) clan or lineage cross marriage, requiring larger, more concentrated populations; (3) advanced farming techniques, requiring larger populations with specialization; (4) fear of hostility from outside groups, providing need for larger concentrations of population. Probably the answer is a combination of several of the above, if not all.

The pattern of fewer, larger-sized villages reached an apex by A.D. 1300. Four sites of this period were located in the valley. It is suggested that a refinement or intensification of the above factors may have caused this. Three were on hills on the valley floor.

The Triangle

As mentioned above, most of the time spent within the limits of the triangle was used in checking the basalt-capped mesa surrounding a broad, relatively flat valley. Almost all of the twelve pre-pottery sites were located on the flat areas on the sides of the mesa, usually where springs running today bubble from the rock. There was some evidence of rock-outlined pithouses associated with three of these sites, but the houses were not in concentrated groups; one or two at a site seems to be the pattern. Several pre-pottery sites were located on the north sides of dry lake beds. No indications of structure could be found.

The only Brown Ware site found in the triangle was located on the side of the mesa near a spring. The other three Plain Ware sites had the Lino Gray as their dominant type. One of these was up on the mesa side, the others were down in the valley.

Group III sites showed a preference for a location on the bench of the mesa near a spring. These sites ranged from "sherd areas," possibly indicating pithouses, two- to three-roomed basalt boulder structures, to small caves.

The Group IV sites were three in number. Two were located on the side of the mesa. All three were quite small; two were caves and the other consisted of several walled fissures in the basalt cliff.

The Group V sites follow the pattern of the previous group. The same caves were utilized; there was no evidence of an expanded occupation. No later sites can be reported for the area.

Snowflake–Mesa Redonda

Only one pre-pottery site was located in this area. It was in the eastern part of the region. No sign of structure was found.

No Plain Ware sites (Group II) were located in this area.

Six sites of Group III association were found here. The predominant preference for location was for small hills down in the valleys. Most of these sites showed long occupation and were relatively large rectangular structures.

A total of eleven Group IV sites was recorded. They included all of the above Group III locations plus five additional ones. The sites were large, rectangular pueblos ranging from 30 to 175 rooms. The largest ruin had a circular Great Kiva depression, 60 feet in diameter.

Only five of the above sites continued to be occupied into a later period as indicated by quantities of Tularosa Black-on-White and St. Johns Polychrome. It must be pointed out that the amount of the later pottery com-

pared to the percentages of the Group IV pottery indicates a drastic decline in population. Or possibly the area was abandoned in an early stage of the Group V period. No later sites in the area east of Snowflake could be found.

When one looks at the total surveyed region in the light of the above information, a rather constant pattern seems to emerge. The earliest occupation, pre-pottery, seems to be concentrated in the Little Colorado Valley and in the triangle. These are mostly camp sites with some evidence of permanent sites with pithouses. It is suggested that the earlier stages of this period are represented by wandering groups following the game animals as indicated by shallow camp sites. Later stages, just before the invention of pottery, may be indicated by the pithouse sites. Future excavation will be necessary to verify this suggestion.

The earlier Plain Ware sites follow roughly the same pattern. A preference is shown for the more eastern reaches of the surveyed area. It is interesting to note that both Gray Ware and Brown Ware sites occur here. This perhaps indicates a transitional "mixing" zone for the Mogollon to the south and the Anasazi to the north.

At the time period represented by the early black-on-whites, the population in the whole area has expanded. It is strongly felt that this period represents an influx of people. Of course, the indigenous people must have been much affected by this immigration.

By the time of Group IV associations, definite Mogollon traits emerge as the dominant pattern. Brown Ware utility wares, Reserve Black-on-White, trough metates, etc., all seem to indicate this. It is at this time that an extreme increase in population can be noted.

The data from the Snowflake area, however, present difficulties to the acceptance of this hypothesis. The Brown Ware utility wares are present and some Reserve Black-on-White, but the overwhelmingly dominant pottery is Snowflake Black-on-White. Here heavy designs, broad, thick lines, opposed solids, are observed—a completely different conception in design style from the Mogollon Reserve–Tularosa series. It is suggested that the Snowflake series shows more of an Anasazi influence, perhaps from Black Mesa Black-on-White or the Walnut series.

If excavation verifies that utility wares are Mogollon in nature while the decorated pottery is Anasazi, then what does this mean? It is difficult to imagine either the utility pottery or the decorated ware as being completely the result of trade. Then how can this situation be explained?

It is possible that this is an area of direct contact—two traditions mixing with strange results. Excavation in the area will probably shed light

on this question. The survey could only examine several sites, and this examination, for the most part, was limited to surface collections of pottery.

If these suggestions are proved, perhaps this area is part of the key to understanding the mixing to the north at this time and later. The Sinagua problems seen in the Flagstaff area might become more clear, especially as to origin and migration routes, if we can learn more about the prehistoric peoples in the Snowflake area.

The later Tularosa–St. Johns horizon sees the abandonment of the Snowflake area. It is also the time of expansion for the Little Colorado area. Snowflake Black-on-White is present in small quantities in this region, even through the later Group VI associations. It would seem that there are two possibilities here: The people from this area east of Snowflake could have moved eastward to contribute to the Little Colorado region and perhaps the Zuni area, or could have moved south and west to the large population centers at Four Mile, Shumway, and Pinedale. It is doubtful that either possibility developed from actual choice, and it is more likely that some people traveled in each direction. Of course, there is the possibility that neither of these choices was the actual one made—another intriguing question that can be answered only by extensive field excavation and further survey work.

In the Little Colorado area, through time, the sites become fewer in number and much larger in size. The pottery design styles suggest that this represents a definite sequence. From Reserve Black-on-White through the late Zuni Glazes, definite traditions in design styles are carried through. The cross-hatching and scrolls can be followed in sequence from Reserve and Tularosa Black-on-White through Wingate Black-on-Red to St. Johns Polychrome into the Glazed types. The hypothesis suggested above must remain unproven until there has been further research in the area.

Very little can be said concerning architecture. Without excavations, any discussion here would be little more than speculation. Building material seems to be a product of the available material. Structures on sites with contemporary pottery and of similar size in the Little Colorado Valley were built of basalt boulders in the absence of sandstone for slabs.

SURVEY COMPARISONS

Working on the chronology for the Zuni area, Leslie Spier suspected Zuni antecedents in the Little Colorado River Valley. A brief survey in the area was undertaken in 1917. Time was spent visiting selected ruins in the area.

From the results of his work, Spier suggests that the antecedents to historic Zuni were, indeed, the later ruins in the Little Colorado Valley.

He also suggests possible Hopi antecedents in this area. We now know that these ideas, set forth in 1918, are being documented at the present time (Spier, 1918, pp. 342, 345).

I visited several of the sites recorded by Spier during his work in 1917. One, the Hooper Ranch Site (Spier survey number 181), was excavated by the Museum during the 1959 field season.

Working in conjunction with the Peabody Museum of Harvard, E. B. Danson surveyed an extremely extensive region, 14,500 square miles, during three seasons. His work covered a square-shaped area in east-central Arizona and west-central New Mexico with Springerville in the approximate northwest corner.

Danson's work was primarily east of the area of this survey, but the western edge of his area borders on the eastern edge of the region covered during the 1959 season.

He suggests the use of the term Alpine Branch for the culture carried by the people living in the mountainous zone south of the area considered in this study. Here, he reports, the culture is dominantly Mogollon in character, but much mingling of San Juan Anasazi traits can be seen. He suggests that the plateau area north of the mountains is Anasazi in nature and uses the term Cibola Region for this area. He says: "The border between the Alpine and Cibola regions can be said to be the northern edge of the central mountain chain which runs eastward from the White Mountains of Arizona into New Mexico." (Danson, 1957, p. 101.) He does say, however, that the border fluctuates through time. He found Mogollon sites extending into the plateau during several periods.

The conclusions from this survey in the Little Colorado area do much to substantiate Danson's findings. He found a marked increase in population beginning in A.D. 900 and continuing through 1300. At the same time, the size of the sites became larger during that period. From the sherd collections and other indications he suggests the possibility of movement from the south down stream in the valley of the Little Colorado (Danson, 1957, p. 111). He correlates this increase with a decline in population which he noted in the southern reaches of his work at the same period in time.

J. B. Rinaldo's survey covered an adjacent area of the Little Colorado drainage with some overlap in the region covered in this survey. He recorded a total of 95 sites. His findings cover the same time period as did this survey, from pre-pottery lithic sites through the period of the Zuni Glazes.

The results of Rinaldo's survey are substantiated and intensified by the above work carried out during the field season of 1959. The similar settle-

ment pattern, dominance of Mogollon material, and temporal population fluctuations can all be seen in the results of this survey.

Rinaldo's work was most intensive in the Vernon area, along Vernon Creek; the area from the Round Valley at Springerville, south to the mountains; and the area north of Concho.

SUMMARY AND CONCLUSIONS

An archaeological survey was conducted in conjunction with the Chicago Natural History Museum's Southwest Expedition during the summer field session of 1959. Sites totaling 107 were recorded in the area extending from Springerville to St. Johns on the Little Colorado; in a large triangular area bounded by highways 60, 260, and 666–260; and in the area east of Snowflake in the Mesa Redonda region.

As far as possible an intensive survey was conducted. In dealing with such an extensive region, many areas had to be left out. There is much more survey work to be done in the country covered by this report. As an example, the area on the north side of the Lyman Dam was not visited. There are undoubtedly many sites here that should be surveyed.

Results show that the area was utilized by people from an early prepottery lithic stage through A.D. 700. From this time, reaching an apex about A.D. 1300, the Little Colorado area was the scene of large pueblos occupied by people who utilized glaze-decorated pottery on red and white slipped vessels. The dominant Mogollon pattern noticed in all the sites occupied from A.D. 900 through 1300 and later gives further evidence to a hypothesis suggested to me by Martin and Rinaldo in personal communications. They suggest that at the time of abandonment of the Reserve area of New Mexico, the Mogollon people were experimenting with these new ideas in pottery design. They further suggest a northern movement of these peoples up the Little Colorado Valley. They feel that this late Mogollon influx into the plateau resulted in a very strong influence upon the Anasazi centers of the present Zuni and Hopi areas. Here, the Chaco-influenced Anasazi traits mingled with the Mogollon traits to produce in these two areas a florescence extending into historic times.

The results of this summer's work, in addition to the results of several other surveys, could produce no evidence that this was not the case. In fact, all indications that could result from survey work seem to substantiate this hypothesis.

The survey has raised a number of problems which can be answered only by future excavation. Among them:

1. The broad question of the people indigenous to this entire area. How did they develop? What was the result of the strong southern influence culminating in the suggested influx of Mogollon people?

2. The finer question of the people who inhabited the Snowflake area from time to time. This area shows little population before A.D. 900; but beginning then and continuing through approximately 1200, it becomes populated by a people making a Black-on-White pottery seemingly Anasazi in origin along with Mogollon utility wares. The area seems to have been abandoned by roughly A.D. 1200. What were the origin and nature of these people and where did they go?

VI. Summary

The results of excavations in two sites in east-central Arizona are reported herein.

MINERAL CREEK SITE

At the Mineral Creek Site, six dwelling rooms and a Great Kiva were cleared and examined. The living rooms were rectangular, walls were built of river cobbles or basalt boulders and lateral doorways were lacking. Entrance was probably through a hatch in the roof. Some rooms had been provided with firepits.

The Great Kiva at the Mineral Creek Site was round (about 9 meters in diameter), lacked masonry walls and was provided with a short, steep, lateral entry. The central hearth area was bounded on three sides by stone-lined vaults; and the roof structure was supported on a quadrangular foundation.

About 7,000 sherds and three whole vessels were found. Snowflake Black-on-White was the most popular painted type (5.31 per cent of the total number of sherds) with Reserve Black-on-White and Tularosa Black-on-White trailing behind. Indented corrugated (similar to Reserve Indented Corrugated) and Alma Plain were the two most popular culinary types. A technological examination of 17 thin sections was made by Mr. Woodland. His petrographic study of these sections indicated that the paste and temper of Snowflake and Reserve Black-on-White are essentially similar. The paste and temper of the plain brown and brown textured wares are also similar and fall into another petrographic grouping.

On the basis of the dominant pottery types—Snowflake, Reserve, and Tularosa Black-on-White—and the presence of indented corrugated and McDonald Corrugated we have placed an estimated date on Mineral Creek Site of A.D. 1000–1200.

HOOPER RANCH PUEBLO

Twenty-five dwelling and storage rooms and two rectangular kivas were excavated at the Hooper Ranch Pueblo. The pueblo was roughly rectangular in shape. The three rectangular kivas (one unexcavated) were

placed at the south end of the pueblo and extended roughly southward from it. The general plan and layout of the village correspond to the "Plaza" type (Stubbs, 1950), that is, rooms clustered about the kivas to form an enclosed courtyard or plaza.

Several periods of construction were noted. Some of the rooms in the lower level were provided with rectangular doorways and niches. Most of the doorways had been sealed. Roofs of the ground level rooms consisted of one or more large beams, the ends of which rested on the tops of the walls. In some instances an upright post placed near the center of the room helped support the main beam. Layers of poles, splints, and adobe were placed on top of the beams. Ceilings may have been about two meters high.

The upper (and later) habitation level was based on the filled-in lower portions of the earlier or lower level. All the roofs were removed and the outer and partition walls were razed to about 150 centimeters above the floor; the intervening spaces (consisting of compartments formed by the walls of the old rooms) were filled with rubble, rocks and relatively clean fill. Then new walls were constructed, although some of the new ones did not coincide with the old ones; new roofs were erected, new, plastered floors were laid, and new firepits built.

The new, upper-level rooms were not provided with doorways and therefore must have been entered through a roof hatch. In addition to firepits, some of these rooms contained bins and ventilators.

The larger rooms in both levels usually contained firepits and usually yielded more artifacts. It is assumed that these were dwelling rooms. The smaller rooms frequently contained charred corn, vegetable remains, and miscellaneous stone and bone tools and probably served as storerooms.

The rooms called kivas were identified as such by their striking similarities to those found in contemporary Hopi and Zuni kivas. These similarities consist of such features as flagstone paving (Kiva II), a platform over the ventilator, a ventilator, a firepit, an ash pit, a vault (Kiva I), niches, and rectangular shape.

From the pueblo and kivas at Hooper Ranch Pueblo we recovered and classified 13,422 sherds and 16 restorable vessels.

The most popular decorated type of pottery was Tularosa Black-on-White (13.55 per cent of the total count). St. Johns Polychrome (2.93 per cent), Pinedale Black-on-Red (2.78 per cent), Heshota-uthla Polychrome (2.46 per cent), and Pinedale Polychrome (1.88 per cent) were weakly represented at the site. Plain corrugated (14.10 per cent) and indented corrugated (25.56 per cent) were the two most popular culinary wares.

A petrographic examination of 26 thin sections of sherds was made by Mr. Woodland, and his report is given in detail in Chapter IV. Included in the technological examinations were thin sections of a lump of potter's clay and of an unfired bowl. On the basis of these examinations, it is conjectured that a Tularosa Black-on-White or a Kwakina Polychrome pot could have been produced from the lump of potter's clay, since the characteristics of the potter's clay and of the two pottery types mentioned are the same. Experiments also indicated that the unfired bowl was to have been a red type such as St. Johns Polychrome.

The petrographic analyses suggested that the decorated pottery was sherd tempered and the culinary wares were not. Red-slipped sherds were more frequently used as grog than were black-on-white ones.

Heshota-uthla Polychrome and Kana-a Gray have some characteristics in common. This might imply that Heshota-uthla Polychrome belongs with an Anasazi pottery assemblage. Pinedale Polychrome from Hooper Ranch Pueblo has paste that resembles that used in three types found at Mineral Creek Site: San Francisco Red, Snowflake Black-on-White, and Reserve Black-on-White.

On the basis of the pottery types found, especially when one considers the abundance of Tularosa Black-on-White and of brown indented corrugated and brown plain corrugated, we estimate that the pueblo dates from about A.D. 1200 to A.D. 1375.

About 1200 artifacts of stone, bone, shell, and clay were recovered from the two sites covered in this report. About 1000 came from the Hooper Ranch Pueblo and about 200 from the Mineral Creek Site. These have been described and discussed at length in Chapter III by Dr. Rinaldo.

It is of interest to note that the assemblages from the two sites are remarkably similar, even though they are separated in space by almost 20 miles and in time by a century or so.

Yet, in spite of the similarities, one can observe differences and specializations, and the presence of certain artifacts that usually occur in later sites (that is, after A.D. 1200) and that would place the Hooper Ranch Pueblo as more recent than the Mineral Creek Site. Such artifacts are axe-sharpening stones, pot rests, smooth saws, antler wrenches, and a large painted pipe of baked clay, with a collar-like section at the bowl end, smaller in diameter than the body proper.

As additional evidence for placing the Hooper Ranch Pueblo in a more recent chronological context than the Mineral Creek Site, we can cite the greater frequency of shell ornaments and beveled manos, the abundance of axes, and the scarcity of choppers at the Hooper Ranch Pueblo. At Mineral Creek Site, axes are absent and choppers are more frequent—

further proof that Mineral Creek Site is older than the Hooper Ranch Pueblo.

The artifacts were produced by the same kinds of techniques at both sites, but at the Hooper Ranch Pueblo the technique of polishing was more frequently resorted to than at the Mineral Creek Site, whereas at the Mineral Creek Site flint chipping was the preferred technique.

When one compares the assemblages from the two sites reported on herein with those from Site 30 (Martin and Rinaldo, 1960a) and from Table Rock Pueblo (Martin and Rinaldo, 1960b), one observes that in general the Hooper Ranch–Mineral Creek artifacts are more neatly finished than those from Site 30 but are not so skillfully and carefully developed as those from Table Rock Pueblo.

A Mogollon ancestry for the Hooper Ranch Pueblo is suggested by the persistence of several traits, the origins of which can be traced back to Mogollon roots. These traits are brown corrugated pottery; pottery with smudged interiors; red pottery; polychrome pottery; three quarters grooved axes; rectangular kivas; animal effigies; straight bore, painted pipes; painted slabs; and painted stone bowls. A careful study of the distribution of types of artifacts in both the lower and upper levels of the Hooper Ranch Pueblo gave Dr. Rinaldo the impression that the upper habitation level was abandoned several years later than the lower one. For example, small, rough cylinders, rubbing stones, and chipped saws of stone occur more frequently on "earlier" sites (A.D. 900–1100), and these turned up with greater frequency in the lower habitation level at Hooper Ranch Pueblo. Conversely, such traits as flat metates, grooved axes, and thick shell bracelets, which are more popular in "later" sites (post A.D. 1300), were more abundant in the upper habitation levels.

It is now fairly clear to us that some elements of the Mogollon culture survived the abandonment by the Mogollon people of the Pine Lawn–Reserve area and their penetration of a new one. The evidence that is accumulating suggests the strong probability that the remarkable flowering of the Hopi and Zuni cultures in the fourteenth and fifteenth centuries may have been due, in no small degree, to the influx of the vigorous, distinct, and desirable Mogollon ideas. It may be that the momentum of development of the Zuni and Hopi cultures had, for some reason as yet unknown, slackened, and that unconsciously the people were athirst for some unifying, regenerative, and spiritual influences. It may be that the earlier and original Zuni or Hopi cultures had been diluted by the influx of several uprooted and homeless tribes whose ideas created disharmony. Perhaps the Zuni or Hopi of the day heard good things about their Mogollon neighbors to the south of them, perceived that their way

of life functioned smoothly and that their supernatural beings brought them rain, snow, fertility, crops; therefore they may have invited their neighbors to move to Zuni-land where they would not only be able to continue their much admired way of life but where they might also propagate their customs.

This hypothesis reverses the usual order of our thinking. Commonly, we have assumed that the Mogollon peoples were forced, by some as yet unspecified reason or causes, to migrate from the Pine Lawn–Reserve area to the Little Colorado River drainage and later to the Zuni country. Perhaps they were asked by a disturbed community to join with it to create a stable, purposeful society.

Thus the movement of some or all of the Mogollon peoples in late times might conceivably be explained, at least in part.

THE ARCHAEOLOGICAL SURVEY

Mr. William Longacre continued the archaeological survey initiated in 1956 by Dr. Rinaldo. A total of 107 sites was recorded.

It seems apparent that the area in the quadrangle enclosed by Snowflake, Show Low, Springerville, and St. Johns was occupied sporadically from a pre-pottery stage to about A.D. 1400 plus or minus 50. The population steadily increased from about A.D. 900 through A.D. 1300. Growth in the size of towns was remarkable after about A.D. 1200 and by A.D. 1300 large pueblos, especially in the valley of the Little Colorado River and near Snowflake, were numerous.

Mogollon traits were dominant at most of the sites from about A.D. 900 to the time the area was abandoned.

In general, the results of Longacre's survey tend to support the hypothesis that the antecedents of the Zuni culture of the fifteenth and sixteenth centuries are Mogollon and are to be found in the valley of the Little Colorado River.

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